

OWNER'S MANUAL

EPJ-30 ELECTRIC POWER PALLET TRUCK



WARNING

Do not operate or service this product unless you have read and fully understand the entire contents of this manual. Failure to do so may result in property damage, bodily injury or death.

BLUE GIANT[®]

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WARNING

Do not operate this truck unless you have been authorized and trained to do so, and have read all warnings and instructions in Operator's Manual and on this truck.

Do not operate this truck until you have checked its condition. Give special attention to wheels, horn, battery, controller, lift system, brakes, steering mechanism, guards and safety devices.

Operate truck only from designated operating position. Do not carry passengers. Keep feet clear of truck and wear foot protection.

Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed.

Start, stop, travel, steer and brake smoothly. Slow down for turns and on uneven or slippery surfaces that could cause truck to slide or overturn. Use special

care when traveling without load as the risk of overturn may be greater.

Always look in direction of travel. Keep a clear view, and when load interferes with visibility, travel with load trailing.

Use special care when operating on ramps travel slowly, and do not angle or turn. Travel with load downhill.

Do not handle loads which are higher than the chassis unless load is secured so that no part of it could fall backward. Before lifting, be sure load is centered, forks are completely under the chassis backrest.

When leaving truck, neutralize travel control, fully lower lifting mechanism and set brake. When leaving truck unattended, also shut off power.

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SECTION 1 DESCRIPTION

1-1. INTRODUCTION.

This publication describes the 24 volt E30 lift truck distributed by Big Lift LLC. Included are operating instructions, planned maintenance instructions, lubrication procedures, corrective maintenance procedures and a complete parts list with part location illustrations.

Users shall comply with all requirements indicated in applicable OSHA standards and current edition of A.N.S.I. B56.1 Part II. By following these requirements and the recommendations contained in this manual, you will receive many years of dependable service from your E30 lift truck.

1-2. GENERAL DESCRIPTION.

The self-propelled E30 truck, [Figure 1-2](#), lifts and transports payloads up to 3000 pounds on rigid forks.

The forward and reverse motion is controlled by either of two controller levers mounted on the control head. Stopping and turning is controlled by the steering arm. Lift and Lower is controlled by pushbuttons on the control head. The battery powered lift truck is quiet and without exhaust fumes.

The reversible AC motor propels the lift truck in forward or reverse direction throughout the available speed range. The E30 lift truck can be driven with

forks raised or lowered. The lift truck must be protected from the elements.

The model number will be found on the name plate ([Figure 1-1](#)) along with the serial number, lifting capacity, and load center. [Figure 1-2](#) shows the locations of the truck's main components and controls.

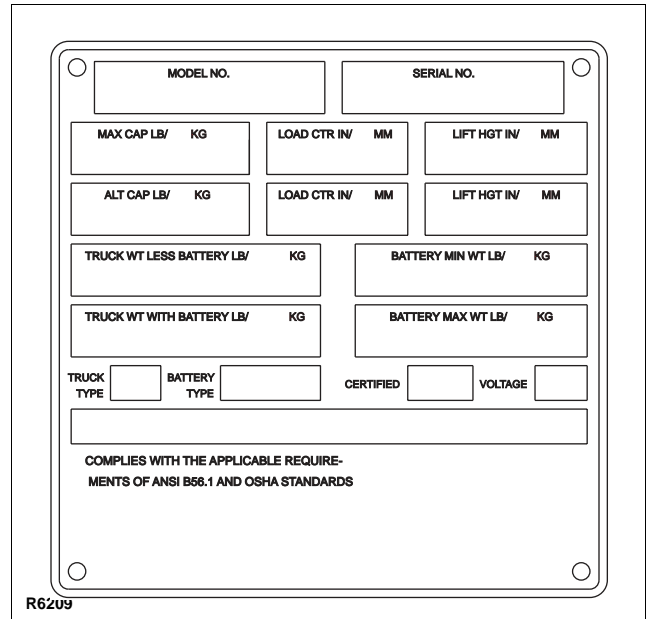


Figure 1-1 Name Plate

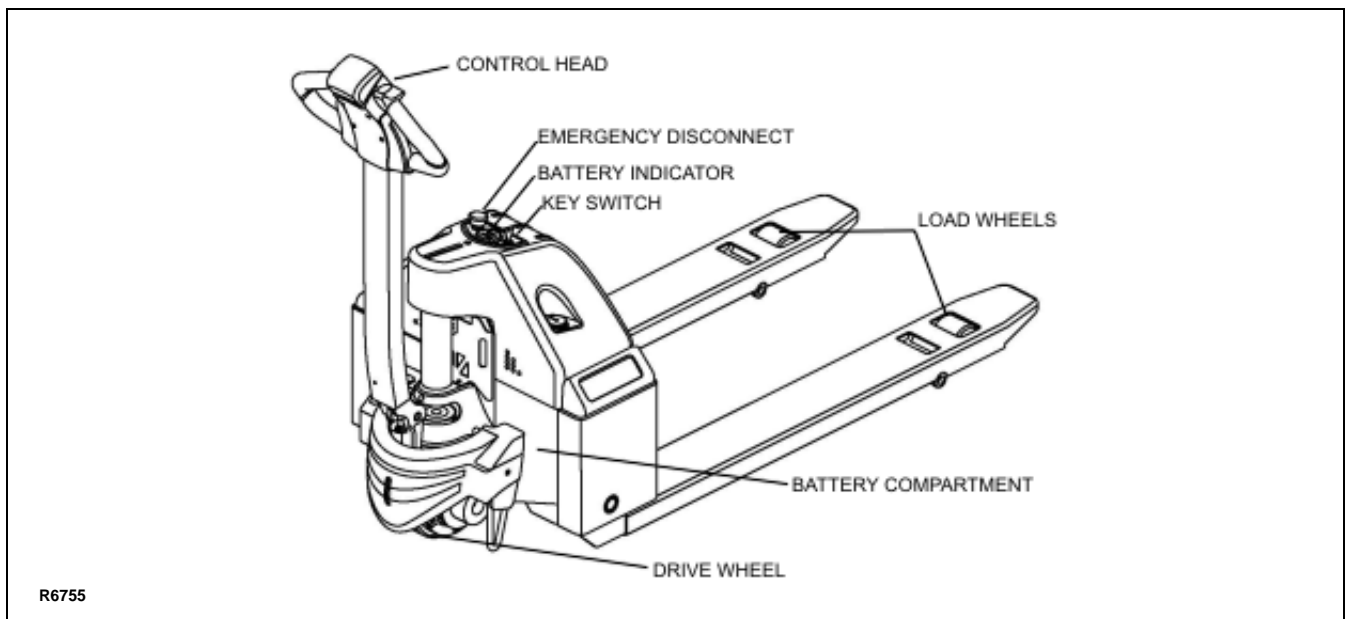


Figure 1-2 . E30 Lift Truck

1-3. SAFETY FEATURES.

The E30 is designed and engineered to provide maximum safety for operator and payload. Some of the safety features incorporated into the design are:

- Dead-man brake to apply the brake and cut off drive power when the steering arm is released.
- Belly-button switch to reverse truck should the operator accidentally pin himself against a wall or obstruction when backing up in slow speed.
- All control functions automatically return to "OFF" when released.
- Emergency Disconnect within operator's reach.
- Readily accessible horn button.
- Handle to provide a firm hand hold for operator.
- Flow control valve regulates maximum lowering speed within prescribed limits.
- Relief valve maintains hydraulic pressure within prescribed limits.
- High visibility color scheme of truck provides visual alert of truck's presence.
- Battery Indicator

SECTION 2 OPERATION

2-1. GENERAL.

This section gives detailed operating instructions for the E30 lift truck. The instructions are divided into the various phases of operations, such as operating lift, driving, and stopping. Routine precautions are included for safe operation.

2-2. OPERATING PRECAUTIONS.

WARNING: Improper operation of the lift truck may result in operator injury, or load and/or lift truck damage. Observe the following precautions when operating the E30 lift truck.

The following safety precautions must be adhered to at all times.

- Do not operate this truck unless you have been trained and authorized to do so and have read all warnings and instructions in this manual and on the truck.
- All warnings and instructions must be read and understood before using the equipment.
- Equipment must be inspected by a qualified person on a regular basis.
- Do not operate this truck until you have checked its condition. Give special attention to Wheels, Horn, Batteries, Controller, Lift System, Brakes, Steering Mechanism, Guards and Safety Devices
- Operate truck only from designated operation position. Wear foot protection. Do not carry passengers.
- Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed.
- Start, stop, travel, steer and brake smoothly. Slow down for turns and on uneven or slippery surfaces that could cause truck to slide or overturn. Use special care when traveling without load as the risk of overturn may be greater.

- Always look in direction of travel. Keep a clear view, and when load interferes with visibility, travel with load or lifting mechanism trailing.
- Do not overload truck. Check nameplate for load weight and load center information.
- Before lifting, be sure load is centered, forks are completely under load, and load is as far back as possible against the chassis.
- Do not handle loads which are higher than the chassis unless load is secured so that no part of it could fall backward.
- When leaving truck, neutralize travel control. Fully lower lifting mechanism and set brake. When leaving truck unattended, turn off key switch and disconnect switch, and remove key.

2-3. BEFORE OPERATION

[Table 2-1](#) covers important inspection points on the E30 lift truck which should be checked prior to operation. Depending on use, some trucks may require additional checks.

[Figure 2-1](#) shows a sample format for an Operator Checklist, which can be modified as necessary to fit your operation.

WARNING: Periodic maintenance of this truck by a QUALIFIED TECHNICIAN is required.

CAUTION: A QUALIFIED SERVICE TECHNICIAN should check the truck monthly for proper lubrication, proper fluid levels, brake operation, motor maintenance and other areas specified in the [SECTION 3](#).

WARNING: If the truck is found to be unsafe and in need of repair, or contributes to an unsafe condition, report it immediately to the designated authority. Do not operate it until it has been restored to a safe operating condition. Do not make any unauthorized repairs or adjustments. All service must be performed by a qualified maintenance technician.

Table 2-1 Operator Checks

ITEM	PROCEDURE
Transmission and hydraulic systems.	Check for signs of fluid leakage.
Forks	Check for cracks and damage.
Safety signs	Check that warning labels, nameplate, etc., are in good condition and legible.
Horn	Check that horn sounds when operated.
Steering	Check for binding or looseness in steering arm when steering.
Travel controls	Check that speed controls on control head operate in all speed ranges in forward and reverse and that belly button switch functions.

ITEM	PROCEDURE
Wheels	Check drive wheel for cracks or damage. Move truck to check load for freedom of rotation.
Hydraulic controls	Check operation of lift and lower to their maximum positions.
Brake	Check that brake actuates when steering arm is raised to upright position, and when lowered to horizontal position.
Deadman/ Parking brake	Check that steering arm raises to upright position when released and brake applies.
Battery disconnect	Check that battery can be disconnected and reconnected. Check for connector damage.
Battery charge	Check the battery indicator.

Electric Truck Daily Operator Check-Off List

Date _____ Operator _____

Truck No. _____ Model No. _____

Dept. _____ Shift _____

Hour Meter
Reading—Drive _____ Hoist _____

Check	O.K. (✓)	Need Maintenance
Tires		
Load Wheels		
Horn		
Lift—Lower Control		
Attachment Operation		
Forward & Reverse Controls		
Steering		
Brakes		
Hydraulic Leaks, Cylinders, Valves, Hoses, Etc.		

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Figure 2-1 Sample of Operator Check List

2-4. GENERAL CONTROL OPERATION.

The speed control (See [Figure 2-2](#)) located on each side of the control head provides fingertip control for driving the truck. Rotate the control in the direction you want to travel. The farther you rotate the control from the neutral position, the faster the truck will travel.

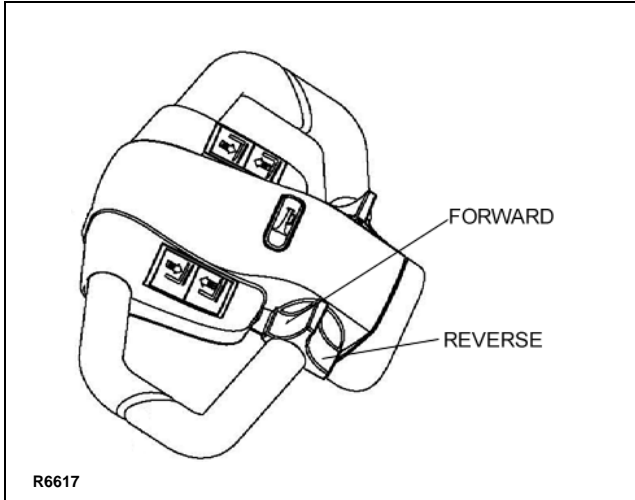


Figure 2-2 Forward/Reverse Control

The pushbutton switches (See [Figure 2-3](#)), located on the front of the control head activate the lift-lower controls and the horn.

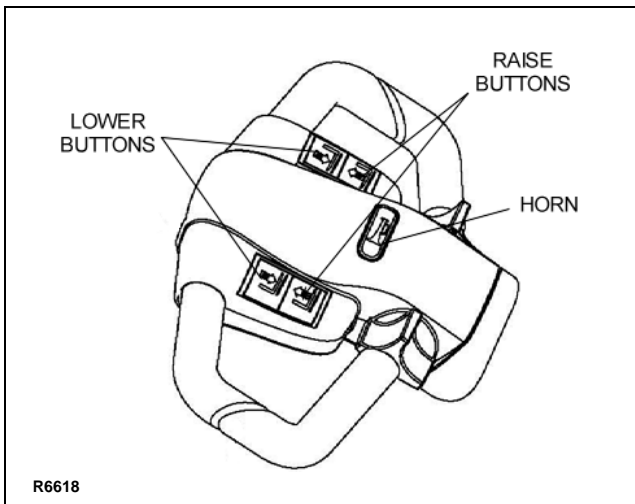


Figure 2-3 Pushbutton Switches

The brake is fully applied by lowering or raising the steering arm. (See [Figure 2-4](#)) All traction control power is shut off when the brake is engaged. When the steering arm is in the upright position, the brake acts as a parking brake. Deadman braking occurs when the handle is released and spring action raises steering arm to the upright position.

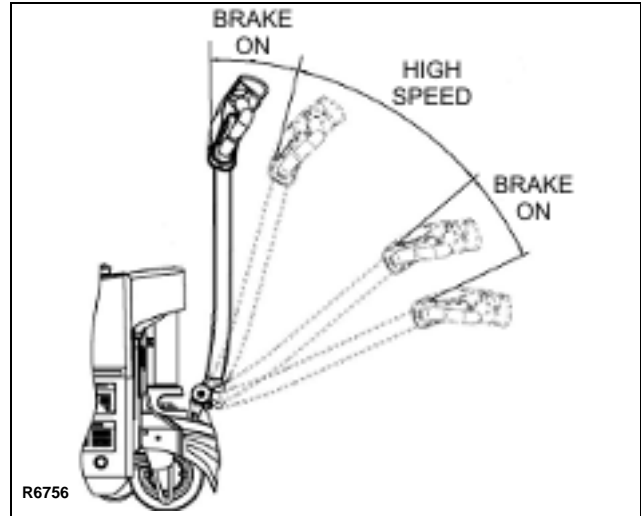


Figure 2-4 Brake Actuation

2-5. DRIVING AND STOPPING PROCEDURES.

1. Turn on the emergency disconnect and the key switch. Grasp the grips of the steering head so that the speed control can be comfortably operated by either thumb.
2. Lower the steering arm to a comfortable position above horizontal to disengage the brake and to energize the electrical circuits. If the truck is not moved, the electrical circuits will time out and will deenergize. See [Figure 2-4](#).
3. To move forward (with load in front), slowly press the speed control forward. See [Figure 2-2](#). Press the forward speed control farther to increase speed.
4. To slow down or stop, release the speed control and lower or raise the steering arm to the horizontal or vertical position. See [Figure 2-4](#). In those positions, the brake engages, slowing or stopping the truck.
5. Procedures for movement in reverse are the same as in the forward direction except slowly press the speed control backward. See [Figure 2-2](#).

2-6. BELLY-BUTTON SWITCH.

The belly-button switch ([Figure 2-5](#)) minimizes the possibility of the driver being pinned by the steering arm while driving the lift truck in slow speed. If the switch presses against the operator while the lift truck is being driven toward the operator, the switch changes the direction of the lift truck.

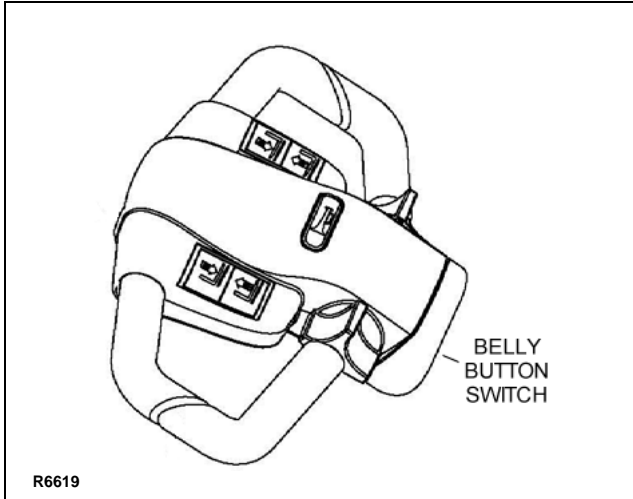


Figure 2-5 Belly-Button Switch

2-7. STEERING ARM GAS SPRING.

The steering arm gas spring automatically raises the steering arm to the upright position when the steering arm is released. If the steering arm does not return fully, the steering arm gas spring requires replacement. Return truck to maintenance for repair.

2-8. LIFT AND LOWER CONTROLS.

Lift/Lower Control buttons are located on the steering control head. (Figure 2-3)

To lift forks, push in either LIFT button and hold until forks reach desired height. To lower forks, push in either LOWER button and hold until forks descend to desired height.

2-9. LOADING AND UNLOADING.

1. Move truck to location where load is to be picked up.
2. Move the truck into position so forks are within pallet or skid, and the load is centered over the forks and as far back as possible.
3. Raise forks to lift load.
4. Drive to area where load is to be placed.
5. Move truck to align load with its new position.
6. Lower the load until it rests squarely in place and the forks are free.
7. Slowly move the truck out from under the load.

2-10. PARKING.

When finished with moving loads, return the truck to its maintenance or storage area. Turn off the emergency Disconnect and the key switch. Charge batteries as necessary. Refer to battery care instructions, [SECTION 3](#).

NOTES

SECTION 3 PLANNED MAINTENANCE

3-1. GENERAL.

Planned maintenance consists of periodic visual and operational checks, parts inspection, lubrication, and scheduled maintenance designed to prevent or discover malfunctions and defective parts. The operator performs the checks in [SECTION 2](#), and refers any required servicing to a qualified maintenance technician who performs the scheduled maintenance and any required servicing.

3-2. MONTHLY AND QUARTERLY CHECKS.

[Table 3-1](#) is a monthly and quarterly inspection and service chart based on normal usage of equipment eight hours per day, five days per week. If the lift truck is used in excess of forty hours per week, the frequency of inspection and service should be increased accordingly. These procedures must be performed by a qualified service technician or your Big Lift LLC Service Representative.

3-3. BATTERY CARE.

3-3.1. General

The E30 may be equipped with maintenance free or industrial wet cell batteries.

The care and maintenance of the battery is very important to obtain efficient truck operation and maximum battery life.

CAUTION: Gases produced by a battery can be explosive. Do not smoke, use an open flame, create an arc or sparks in the vicinity of the battery. Ventilate an enclosed area well when charging.

CAUTION: Batteries contain sulfuric acid which may cause severe burns. Avoid contact with eyes, skin or clothing. In case of contact, flush immediately and thoroughly with clean water. Obtain medical attention when eyes are affected. A baking soda solution (one pound to one gallon of water) applied to spilled acid until bubbling stops, neutralizes the acid for safe handling and disposal.

Leakage voltage from battery terminals to battery case can cause misleading trouble symptoms with the truck electrical system. Since components of the truck electrical system are insulated from truck frame, leakage voltage will not normally affect truck operation unless a short circuit or breakdown of circuit wire insulation to truck frame occurs.

A voltage check from battery connector terminal to battery case should indicate near zero volts. Typically, however, the sum of the voltages at both terminals will equal battery volts. This leakage voltage will discharge the battery. As battery cleanliness deteriorates, the usable charge of the battery decreases due to this self discharge.

Table 3-1 Monthly and Quarterly Inspection and Service Chart

VISUAL CHECKS	
INTERVAL	INSPECTION OR SERVICE
Monthly	Check electrical brake for proper operation.
Monthly	Check load wheels for wear. A poly load wheel must be replaced if worn to within 1/16 inch of hub. Check for separation from hub.
Monthly	Check drive wheel for wear. A poly drive wheel must be replaced if worn to within 3/4 inch of hub. Check for separation from hub.
Monthly	Inspect wiring for loose connections and damaged insulation.
Monthly	Inspect contactors for proper operation.
Monthly	Check deadman brake switch for proper operation.
Quarterly	Check lift cylinder for leakage.
Quarterly	Check for excessive jerking of steering arm when stopping or starting.

Although a leakage voltage reading of zero volts may not be possible, a cleaner battery will have more usable charge for truck operation and not affect operation of electronic devices on the unit.

3-3.2. Safety Rules

- Wear protective clothing, such as rubber apron, gloves, boots and goggles when performing any maintenance on batteries. Do not allow electrolyte to come in contact with eyes, skin, clothing or floor. If electrolyte comes in contact with eyes, flush immediately and thoroughly with clean water. Obtain medical attention immediately. Should electrolyte be spilled on skin, rinse promptly with clean water and wash with soap. A baking soda solution (one pound to one gallon of water) will neutralize acid spilled on clothing, floor or any other surface. Apply solution until bubbling stops and rinse with clean water.
- If truck is equipped with wet cell batteries, keep vent plugs firmly in place at all times except when adding water or taking hydrometer readings. Do not allow dirt, cleaning solution or other foreign material to enter cells. Impurities in electrolyte has a neutralizing effect reducing available charge.
- Do not bring any type of flame, spark, etc., near the battery. Gas formed while the battery is charging, is highly explosive. This gas remains in cell long after charging has stopped.
- Do not lay metallic or conductive objects on battery. Arcing will result.
- Do not touch non-insulated parts of DC output connector or battery terminals to avoid possible electrical shock.
- De-energize all AC and DC power connections before servicing battery.
- Do not charge a frozen battery.
- Do not use charger if it has been dropped or otherwise damaged.

3-3.3. Battery Care and Charging

CAUTION: Never smoke or bring open flame near the battery. Gas formed during charging is highly explosive and can cause serious injury.

1. Charge the battery only in areas designated for that use.
2. Battery terminals should be checked and cleaned of corrosion regularly. Good battery terminal contact is essential not only for operation, but also for proper charging of the battery.
3. The charging requirements will vary depending on the use of the truck. The battery should be given as equalizing charge on a weekly basis. This charge should normally be an additional three hours at the finish rate.
4. Make certain battery used meets weight and size requirements of truck. NEVER operate truck with an undersized battery.

3-3.4. Battery Cleaning

Always keep vent plugs tightly in place when cleaning battery. When properly watered and charged, the battery will remain clean and dry. All that is necessary is to brush or blow off any dust or dirt that may accumulate on them. However, if electrolyte is spilled or overflows from a cell, it should be neutralized with a solution of baking soda and water, brushing the soda solution beneath the connectors and removing grime from the covers. Then rinse the battery with cool water from a low pressure supply to remove the soda and loosen dirt. If batteries stay wet consistently, they may be either overcharged or over filled. This condition should be investigated and corrected.

3-3.5. MAINTENANCE FREE BATTERIES

Some trucks may be equipped with maintenance free batteries. These batteries are completely sealed, will not require any watering and have a full 80% discharge available.

Sealed Maintenance Free batteries contain a pressure release valve and under normal operating conditions do not require any special ventilation.

CAUTION: Do not try to open this battery or remove the pressure release valve.

Only under severe overcharging, such as connected to an improperly sized charger, will any significant amount of gasses be released from the battery. Also, being a valve regulated battery, it never requires watering.

3-4. CHARGING BATTERIES

Charging requirements will vary depending on depth of discharge and temperature. Follow safety rules when placing a battery on charge.

Proceed as follows:

1. Park truck at charging station with forks lowered and turn the key switch off.
2. Check the condition of the AC cord and battery cables. If there are any cuts in the cable, any exposed wires, loose plugs or connectors, DO NOT attempt to charge the batteries. Contact appropriate personnel for repairs to be made.
3. Pull the charger cord out of the top cover (Figure 3-1) and connect to the appropriate power supply.

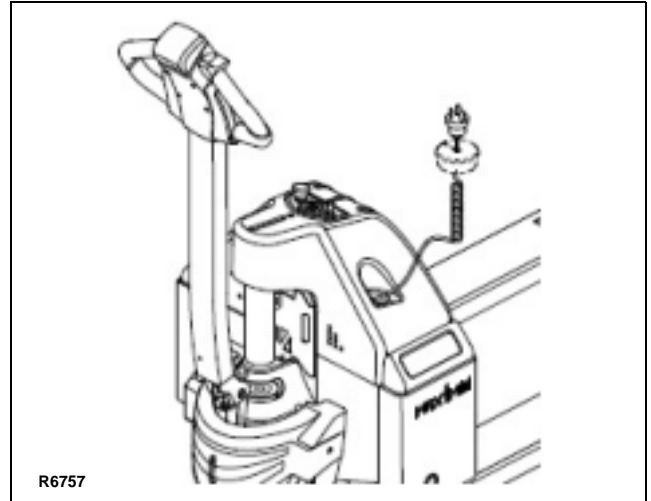



Figure 3-1 Battery Charging

<p>BATTERY HAZARD</p> 	<p>! DANGER</p> <p>EXPLOSIVE/POISON/CAUSTIC NO SPARKS, FLAMES, SMOKING BATTERY ACID can cause blindness and severe burns SHIELD EYES, AVOID SKIN CONTACT IF SPLASHED flush immediately with water, get medical help fast.</p> <p>Do not service battery while on charge. Do not connect or disconnect battery from charger while charger is on.</p> <p>Only qualified and experienced personnel should perform maintenance and repair on batteries. Use caution while servicing or removing battery. (Refer to Battery Safety Sheet).</p>
---	---

3-5. BATTERIES REPLACEMENT

Access to the batteries requires moving the Charging requirements will vary depending on depth of discharge and temperature. Follow safety rules when placing a battery on charge.

Proceed as follows:

- a. Remove two screws (1, [Figure 3-2](#)) and remove the upper compartment cover.

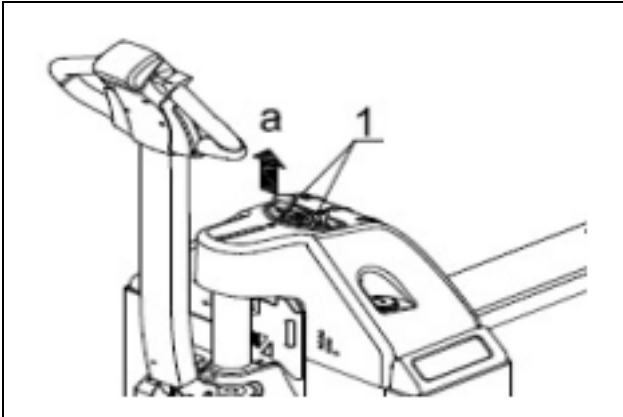


Figure 3-2 Cover Removal

- b. Remove four screws (1, [Figure 3-3](#)), four washers (2).

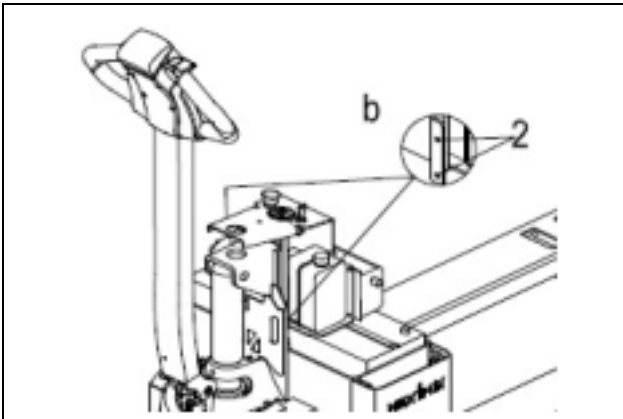


Figure 3-3 Screw Removal

- c. Tag and disconnect the three battery cables ([Figure 3-4](#)).
- d. Rotate control arm to the extreme position as shown in [Figure 3-5](#).
- e. Pull electrical panel (5, [Figure 3-5](#)) a little out.
- f. Turn the electrical panel to the direction as shown in [Figure 3-5](#) until it is clear of the batteries.

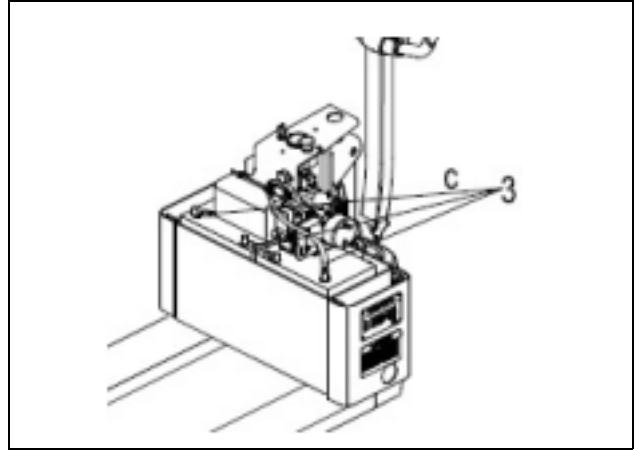


Figure 3-4 Disconnect Battery Cables

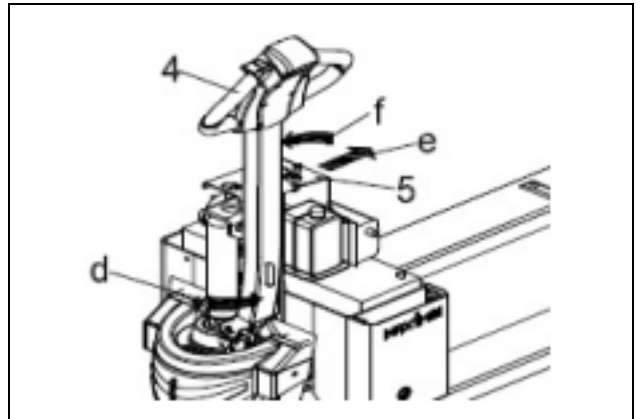


Figure 3-5 Reposition Electrical Panel

- g. Replace batteries (6, [Figure 3-6](#)).

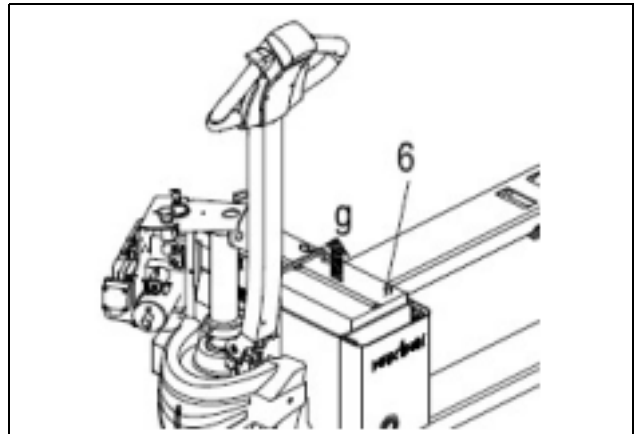


Figure 3-6 Cover Removal

- h. Install in the reverse order of remove.

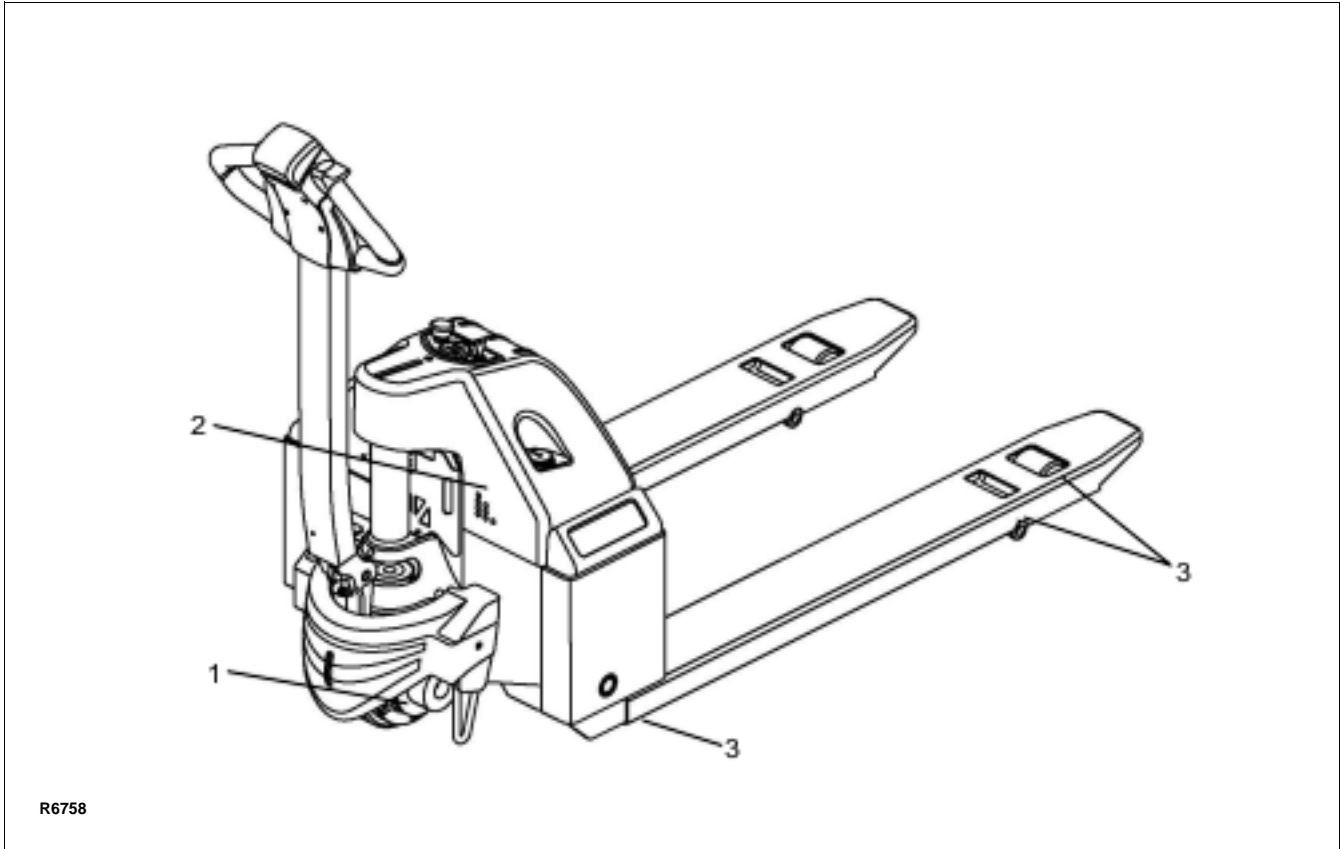
3-6. LUBRICATION.

Refer to [Table 3-2](#) for the recommended types of grease and oil. [Table 3-3](#) in conjunction with [Figure 3-7](#) identifies the items requiring lubrication.

**Table 3-2 Recommended Lubricants
(See [Table 3-3](#) for Application)**

No. 1	Transmission oil—EP SAE 80W-90 Transmission oil—EP SAE 10W-30 (Note)
No. 2	Grease—Lithium base, general purpose.
No. 3	Hydraulic oil-Heavy duty with a viscosity of 150 SUS foam suppressing agent and rust and oxidation inhibitors Hydraulic oil-Heavy duty with a viscosity of 100 SUS foam suppressing agent and rust and oxidation inhibitors (Note)
No. 4	SAE 30 or 40 Engine lubricating oil

NOTE: USED ON COLD CONDITIONED TRUCKS



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Figure 3-7 Lubrication Diagram

Table 3-3 Lubrication Chart

FIG 3-2 INDEX NO.	LOCATION	METHOD OF APPLICATION	TYPE (Table 3-3)	APPLICATION OF LUBRICANT
1	Transmission Capacity 2 pints	Can	No. 1	Fill to level plug opening
2	Hydraulic Reservoir Capacity-1 quarts	Can	No. 3	With lift carriage fully lowered, fill reservoir with hydraulic oil to 1 inch below opening
3	Lift Linkage Fittings*	Gun	No. 2	Pressure lubricate.

* Raise lift carriage to gain access to grease fittings.

SECTION 4 TROUBLESHOOTING

4-1. GENERAL

Use [Table 4-1](#) as a guide to determine possible causes of trouble. The table is divided into five main categories: Truck and Hydraulic System Will Not

Operate: Truck Does Not Operate Forward or Reverse: Trouble With Braking: Trouble With Lifting Or Lowering, and Miscellaneous malfunctions.

Table 4-1 Troubleshooting Chart

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
<p>TRUCK AND HYDRAULIC SYSTEM WILL NOT OPERATE Truck will not travel nor will lift system operate.</p>	<p>a. Fuse (16, Figure 12-16) blown. b. Battery dead or disconnected. c. Keyswitch (23, Figure 12-16) defective. d. Defective wiring.</p>	<p>Check fuse and replace if necessary. Check battery connections and check battery voltage. Bypass keyswitch to determine if it is malfunctioning. Check for open circuit. Repair as required.</p>
<p>TRUCK DOES NOT OPERATE FORWARD OR REVERSE Truck does not travel forward or reverse. All other functions operate normally.</p> <p>Truck travels forward but not in reverse.</p> <p>Truck travels reverse but not in forward.</p> <p>Truck travels forward and in reverse at lower speeds; will not travel at high speed.</p>	<p>a. Check all wiring. A loose connection may be the cause of malfunction. b. Defective deadman switch (16, Figure 12-1). c. Defective controller (3, Figure 12-16). d. Defective potentiometer (21, Figure 12-2). Defective potentiometer (21, Figure 12-2) in control head. Defective potentiometer (21, Figure 12-2) in control head. Defective potentiometer (21, Figure 12-2) in control head.</p>	<p>Tighten all loose connections before further troubleshooting. Check and replace switch if defective. Check for proper operation and replace if necessary. Check and replace potentiometer if defective. Check and replace potentiometer if defective. Check and replace potentiometer if defective.</p>
<p>TROUBLE WITH BRAKING Truck does not slow with brake, or brake does not engage.</p> <p>Brake will not release.</p>	<p>a. Defective deadman switch (16, Figure 12-1). b. Defective electric brake (35, Figure 12-7). a. Brake temperature above 281° F (140° C). b. Open brake circuitry or wiring.</p>	<p>Check deadman switch for continuity. If none found when the control arm is in the brake position, replace switch. Replace brake. Allow to cool. Make voltage checks.</p>

Table 4-1 Troubleshooting Chart - Continued

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
<p>TROUBLE WITH BRAKING - Continued</p> <p>Brake drags.</p> <p>Brake grabs.</p> <p>Abnormal noise and chatter when brake is applied.</p>	<p>Defective electric brake (35, Figure 12-7).</p> <p>Defective electric brake (35, Figure 12-7).</p> <p>Defective electric brake (35, Figure 12-7).</p>	<p>Replace.</p> <p>Replace.</p> <p>Replace.</p>
<p>TROUBLE WITH LIFTING OR LOWERING</p> <p>Oil sprays or flows from the top of the lift cylinder.</p> <p>Squealing sounds when lifting forks.</p> <p>Forks do not lift to top.</p> <p>Weak, slow or uneven action of hydraulic system.</p> <p>Forks do not lift, pump motor does not run.</p>	<p>.</p> <p>Defective packing in lift cylinder</p> <p>a. Oil level too low.</p> <p>b. Lift linkage binding.</p> <p>Oil level too low.</p> <p>a. Defective pump or relief valve.</p> <p>b. Worn lift cylinder.</p> <p>c. Load larger than capacity.</p> <p>d. Defective lift motor solenoid.</p> <p>e. Battery charge low.</p> <p>a. Battery is dead or disconnected.</p> <p>b. Defective wiring.</p> <p>c. Defect in electrical system for operating pump motor.</p>	<p>Repair lift cylinder.</p> <p>Identify oil leak.</p> <p>Apply grease.</p> <p>Add oil to reservoir.</p> <p>Check pressure. Adjust as necessary.</p> <p>Replace cylinder.</p> <p>Refer to I.D.plate for capacity.</p> <p>Replace solenoid (2, Figure 12-14) on electrical panel.</p> <p>Charge battery.</p> <p>Check and recharge if required.</p> <p>Check and repair as required.</p> <p>Check lift switch in control head, as well as the solenoid.</p>
<p>Forks do not lift, motor runs.</p>	<p>Defect in hydraulic system.</p>	<p>Check the oil level in the reservoir and the oil lines to the lift cylinder, and repair as required. If normal, check the hydraulic pump, and relief valve. Repair, or adjust.</p>

Table 4-1 Troubleshooting Chart - Continued

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
<p>TROUBLE WITH LIFTING OR LOWERING - Continued</p> <p>Forks lift, but will not go down.</p>	<p>Defect in hydraulic system</p>	<p>Check lowering control switch in control head and lowering solenoid on valve assembly (17, Figure 12-14). Replace as required.</p>
<p>Load will not hold</p> <p>Platform does not lift to top. Pump motor runs.</p> <p>Forks creep downward under load when in a raised position.</p>	<p>a. Oil bypassing internally in control valve</p> <p>b. Worn lift cylinder or packing.</p> <p>a. Oil level too low.</p> <p>b. Load larger than capacity.</p> <p>c. Batteries need charging.</p> <p>Leak in hydraulic system, lift cylinder or lowering valve.</p>	<p>Replace valve assembly (4, Figure 12-14).</p> <p>Repack cylinder.</p> <p>Add oil to reservoir.</p> <p>Refer to nameplate on side of mast for maximum load capacity.</p> <p>Change batteries.</p> <p>Check for leaking fitting in hydraulic line and repair as required. Repack lift cylinder or replace valve assembly (4, Figure 12-14).</p>
<p>MISCELLANEOUS</p> <p>Steering arm does not return to the upright position.</p> <p>Truck moves forward when arm is pulled down.</p> <p>Steering arm jerks excessively starting or stopping the truck.</p> <p>Drive motor is jerky.</p>	<p>a. Weak return spring.</p> <p>b. Binding.</p> <p>a. Belly-button switch defective.</p> <p>b. Short in control head.</p> <p>Drive wheel worn.</p> <p>Motor internally damaged or worn.</p>	<p>Replace spring.</p> <p>Check and free the binding item. Verify that the cable has not been damaged. Repair or replace as needed.</p> <p>Check for short, and repair or replace as necessary.</p> <p>Check wiring and repair as required.</p> <p>Replace drive wheel if worn to within 3/4 inch of hub.</p> <p>Replace motor.</p>

4-2. CONTROLLER TROUBLESHOOTING

4-2.1. Fault Detection.

The controller provides diagnostics information to assist technicians in troubleshooting drive system problems. When a fault is detected, the appropriate fault code is signaled via the panel mounted LED.

4-2.2. Hand Held Programmer (Optional)

The hand held programmer is available that is designed specifically for use with the controller. The programmer is available through your Big Lift LLC dealer.

4-2.3. Fault Recording.

Fault events are recorded in the controller's memory. However, multiple occurrences of the same fault are recorded as one occurrence.

The fault event list can be loaded into the programmer for readout. The Special Diagnostics mode provides access to the controller's diagnostic history file. The history file contains the entire fault event list created since the diagnostic history file was last cleared. The standard Diagnostics mode provides information about only the currently active faults.

4-2.4. General Checkout.

Carefully complete the following checkout procedure. If you find a problem during the checkout, refer to paragraph 4-2.7. for further information.

The checkout can be conducted with or without the handheld programmer (See Paragraph 4-2.2.). However, the checkout procedure is easier with a programmer. To evaluate the system without a programmer, observe the LED and note the flashing pattern and refer to Table 4-2 for the code description.

CAUTION: Put the vehicle up on blocks to get the drive wheel off the ground before beginning these tests.

Turn the keyswitch off and make sure the brake is applied, the throttle is in neutral, and the forward/reverse switches are open.

Do not stand, or allow anyone else to stand directly in front of or behind the vehicle during the tests.

1. Disconnect the battery charger and connect the programmer to the 4-pin connector (Figure 4-1) on the controller.



Figure 4-1. Controller Terminals

2. Turn the lift truck key switch to the ON position. The programmer should "power up" with an initial display (2, Figure 4-2), and the controller's Status LED should begin steadily blinking a single flash. If neither happens, check for continuity in the key switch circuit and controller ground.

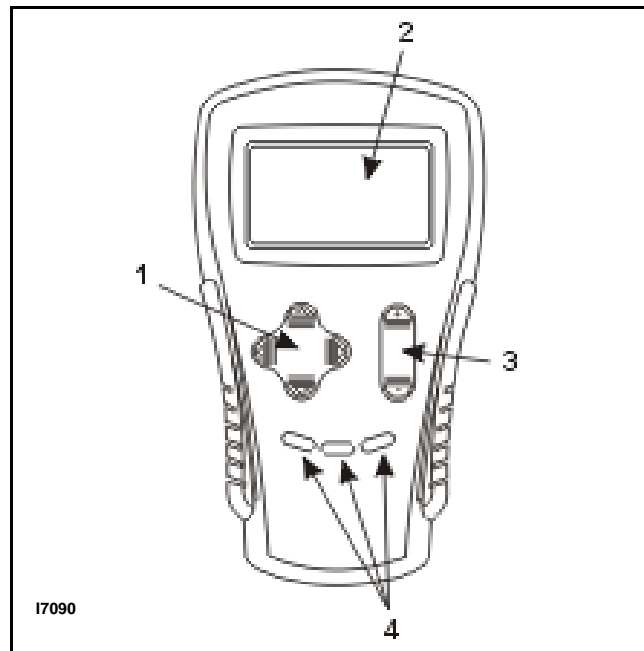


Figure 4-2. Hand Held Programmer

3. Put the controller into the diagnostic mode by pressing the "Menu Navigation Key" (1, [Figure 4-2](#)). Using the Navigation key, select the Faults menu. Display the Faults menu by pressing the Right side of the Navigation key. Press the Right side of the Navigation key again to display the list of System Faults. The display should indicate "No Known Faults."

Release the brake by pulling down the steering arm into the operating position. The controller's LED should continue blinking a single flash and the programmer should continue to indicate no faults. If there is a problem, the LED will flash a diagnostic code and the programmer will display a diagnostic message. If you are conducting the checkout without a programmer, look up the LED diagnostic code in [Table 4-2](#).

When the problem has been corrected, it may be necessary to cycle the brake in order to clear the fault code.

4. With the brake released, select a direction and operate the throttle. The motor should begin to turn in the selected direction. If it does not, verify the wiring to the forward/reverse switches and motor. The motor should run proportionally faster with increasing throttle. If not, refer to [Paragraph 4-2.7](#).

5. Put the controller into the test mode by using the Navigation key (1) to select the "Monitor" menu. Select the Monitor mode by pressing the "Right" arrow on the Navigation key. Press the Navigation key "Down" arrow to scroll down to observe the status of the forward, reverse, brake, emergency reverse, and mode switches. Cycle each switch in turn, observing the programmer. Each input should show the correct state on the programmer.
6. Check the controller's fault detection circuitry as described in [Paragraph 4-2.5](#).
7. Take the vehicle off the blocks and drive it in a clear area. It should have smooth acceleration and good top speed.
8. Test the plug braking of the vehicle. The vehicle should smoothly slow to a stop and reverse direction, with the audible plugging tone.
9. Verify that all options, such as high pedal disable (HPD), static return to off (SRO), and anti-tie-down, are as desired.
10. Check to see whether the emergency reverse (belly button) feature is working correctly. Verify that the circuit is operational by momentarily disconnecting one of the emergency reverse wires. The vehicle should be disabled and a fault indicated.

4-2.5. Diagnostic History

The handheld programmer can be used to access the controller's diagnostic history file. When the programmer is connected to the unit, the error log file is automatically uploaded into the handheld programmer.

To see the present status of the unit, use the Menu Navigation Key (1, [Figure 4-2](#)) to select:

Faults->System Faults.

To access this log, use the Menu Navigation Key to select:

Faults->Fault History

The faults are shown as a code and descriptive text. If there are multiple faults, you have to scroll through the list using the Up and Down Buttons on the Menu Navigation Key

The faults may be intermittent faults, faults caused by loose wires, or faults caused by operator errors. Faults such as HPD or over-temperature may be caused by operator habits or by overloading.

After a problem has been diagnosed and corrected, clearing the diagnostic history file is recommended. This allows the controller to accumulate a new file of faults. By checking the new diagnostic history file at a later date, you can quickly determine whether the problem has been completely fixed.

To clear the diagnostic history file, select:

Faults->Clear Fault History.

You will be asked to confirm your actions. Use the "plus" arrow (+) for yes to clear the menu and the "minus" arrow (-) (3) to cancel your selection and not clear the Fault History.

4-2.6. Test the Fault Detection Circuitry

1. Put the vehicle up on blocks to get the drive wheel off the ground.
1. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).

2. Using an inline fuse holder fitted with a 10 amp fuse and alligator clips, connect the controller's M and B- terminals.
3. Turn on the emergency disconnect (20) the key switch (23). Release the brake and apply the throttle. The motor should not operate.
4. Leave the key switch on and remove the in-line fuse wire. The vehicle status should continue to remain off.
5. Cycle the key switch off and on. Release the brake and apply the throttle. The vehicle should now operate normally.

4-2.7. Diagnostics and Troubleshooting.

The motor controller provides diagnostics information to assist in troubleshooting drive system problems. The diagnostics information can be obtained in two ways:

- Reading the appropriate display on the programmer
- Observing the fault codes issued by the panel mounted Status LED.

4-2.7.1. LED Diagnostics

During normal operation with no faults present, the Status LED is steady on. If the controller detects a fault the Status LED flashes a fault identification code continuously until the fault is corrected.

NOTE: The Status LED can only indicate one fault at a time. If multiple faults are detected, the highest priority fault code flashes until it is cleared.

With Fault Code Type parameter is set to 0, the status LED uses the fault codes listed in [Table 4-2](#). Six single-digit codes are used: 2, 3, 5, 6, 7, and 9.

For suggestions about possible causes of the various faults, refer to [Table 4-3](#) Troubleshooting Chart.

4-2.8. Programmer Diagnostics

With a programmer, diagnostics and troubleshooting is more direct than with the LED alone. The programmer presents complete diagnostic information in plain language - no code to decipher. Faults are displayed in the Diagnostic Menu, and the status of the controller inputs/outputs is displayed in the Test Menu.

The following 4-step process is generally used for diagnosing and troubleshooting an inoperative vehicle using the programmer:

1. Visually inspect the vehicle for obvious problems:
2. Diagnose the problem:
3. Test the circuitry with the programmer:
4. Correct the problem.

Repeat the last three steps as necessary until the vehicle is operational.

Refer to the [Table 4-3](#) for suggestions covering a wide range of possible faults.

Table 4-2 LED Codes

LED Code		Explanation
LED Off	Not illuminated	No power or defective controller
Solid On	Always on	Controller operational, no faults
2	00	Undervoltage Fault
3	000	Overvoltage Fault
5	00000	Brake ON Fault
6	000000	HPD Fault Wiring Fault *
7	0000000	Speed Pot Fault Throttle Fault
9	000000000	Battery Disconnect Fault* Brake OFF Fault Current Sense Fault* EE Checker Fault† Hardware Failsafe* Main Fault* Main OFF Fault Main ON Fault Precharge Fault*
* = Must cycle keyswitch to clear		
† = Must use programmer to clear, as follows: select Program menu, alter data value of any parameter, cycle keyswitch.		

Table 4-3 Troubleshooting Chart

LED CODE	PROGRAMMER LCD DISPLAY	POSSIBLE CAUSE	FAULT CLEARANCE
9	Battery Disconnect Fault	Battery disconnected	1. Battery not connected. 2. Poor connection to battery terminals.
9	Battery OFF Fault	Brake OFF Fault	1. Electromagnetic brake driver open. 2. Electromagnetic brake coil shorted.
5	Brake ON Fault	Brake ON fault	1. Electromagnetic brake driver shorted. 2. Electromagnetic brake coil open.
9	Current Sense Fault	Current sense out of range	1. Short in motor on in motor willing. 2. Controller failure. *
9	EEPROM Checksum Fault	EEPROM fault	EEPROM failure or fault
9	Hardware Failsafe	Motor voltage out of range	1. Motor voltage does not correspond to throttle request. 2. Short in motor or in motor wiring. 3. Controller failure.*
6	HPD Fault	HPD (High Pedal Disable)	1. Improper sequence of throttle and KSI, push or inhibit pot. 2. Misadjusted throttle pot.
9	Main Fault	Main contactor fault	1. Main contractor welded or stuck open. 2. Main contactor driver fault.
9	Main OFF Fault	Main contactor driver Off fault	Main contactor driver failed open.
9	Main ON Fault	Main contactor driver On fault	Main contactor driver failed closed.
3	Overvoltage Fault	Battery voltage too high	1. Battery voltage >31 volts. 2. Vehicle operating with charger attached. 3. Intermittent battery connection.
9	Precharge Fault	Precharge fault	1. Brake driver shorted. 2. Precharge circuit damaged. 3. MOSFET failure.
7	Speed POT Fault	Speed limit pot wiper out of range	1. Speed limit pot wire(s) broken or shorted. 2. Broken speed limit pot.

Table 4-3 Programmable Parameters - Continued

LED CODE	PROGRAMMER LCD DISPLAY	POSSIBLE CAUSE	FAULT CLEARANCE
7	Throttle Fault	PotLow and /or PotWiper out of range	<ol style="list-style-type: none"> 1. Throttle input wire open or shorted. 2. Throttle pot defective. 3. Wrong throttle type selected.
2	Undervoltage Fault	Battery voltage too low	<ol style="list-style-type: none"> 1. Battery voltage <17 volts. 2. Bad connection at battery or controller.
6	Wiring Fault	HPD fault present >10 sec.	<ol style="list-style-type: none"> 1. Misadjusted throttle. 2. Broken throttle pot or throttle mechanism.

NOTES

SECTION 5 STEERING ARM, CONTROL HEAD AND COMPARTMENT

5-1. CONTROL HEAD

5-1.1. Control Head Removal

1. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
2. Remove the cap assembly (1, [Figure 5-2](#)) as described in paragraph 5-1.3.
3. Disconnect harness (15, [Figure 5-1](#)) from potentiometer (21, [Figure 5-2](#)).

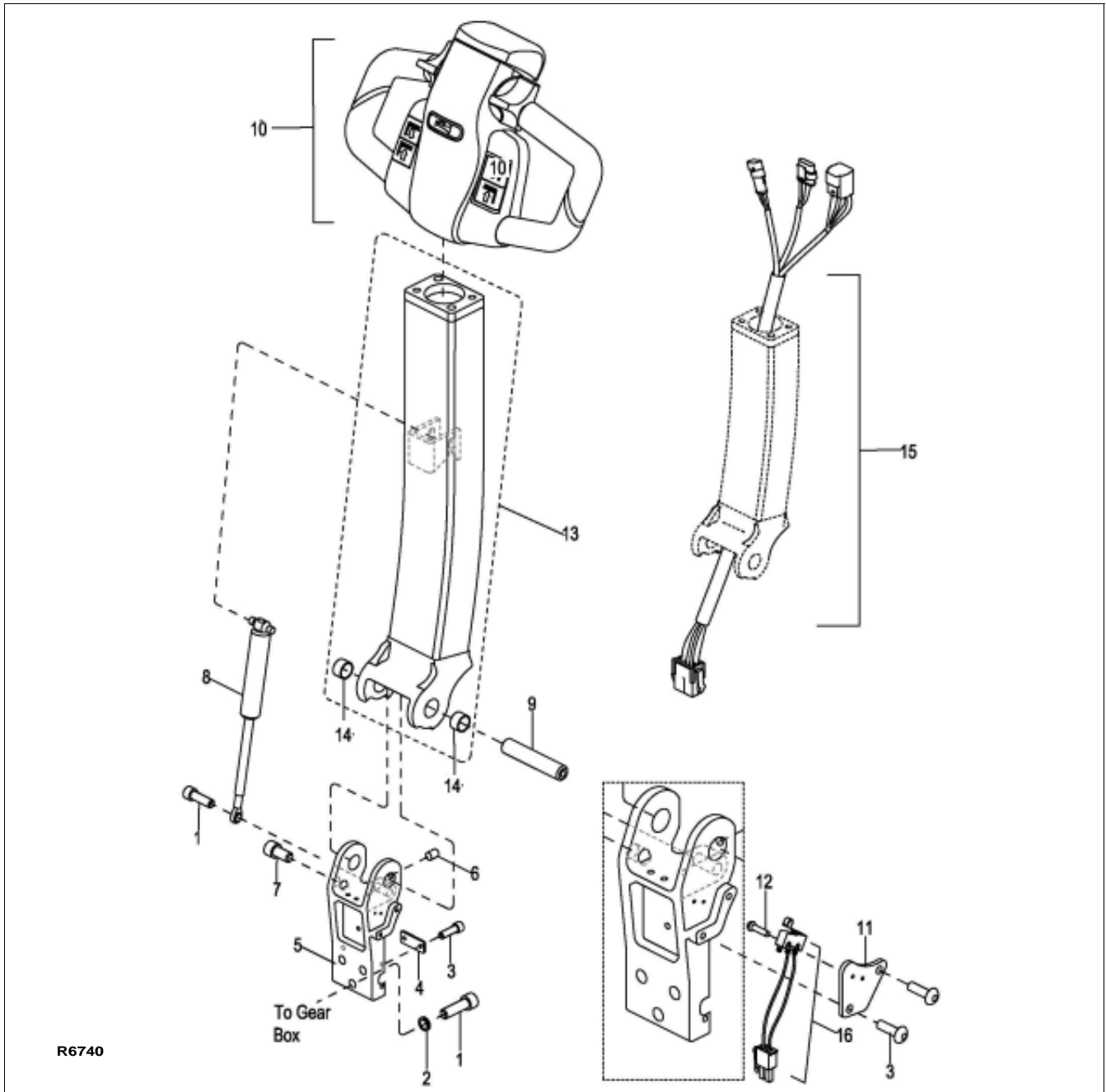


Figure 5-1 Steering Arm

4. Disconnect harness (15, [Figure 5-1](#)) from emergency reverse switch (15, [Figure 5-2](#)).
5. Remove two screws (5), two washers (7) and two flat washers (6).

WARNING: When removing the control head in the following steps, be sure to hold it in place until the control harness is disconnected.

6. Remove two screws (11), two washers (12) and two flat washers (13).
7. Remove the control head and handle (19).

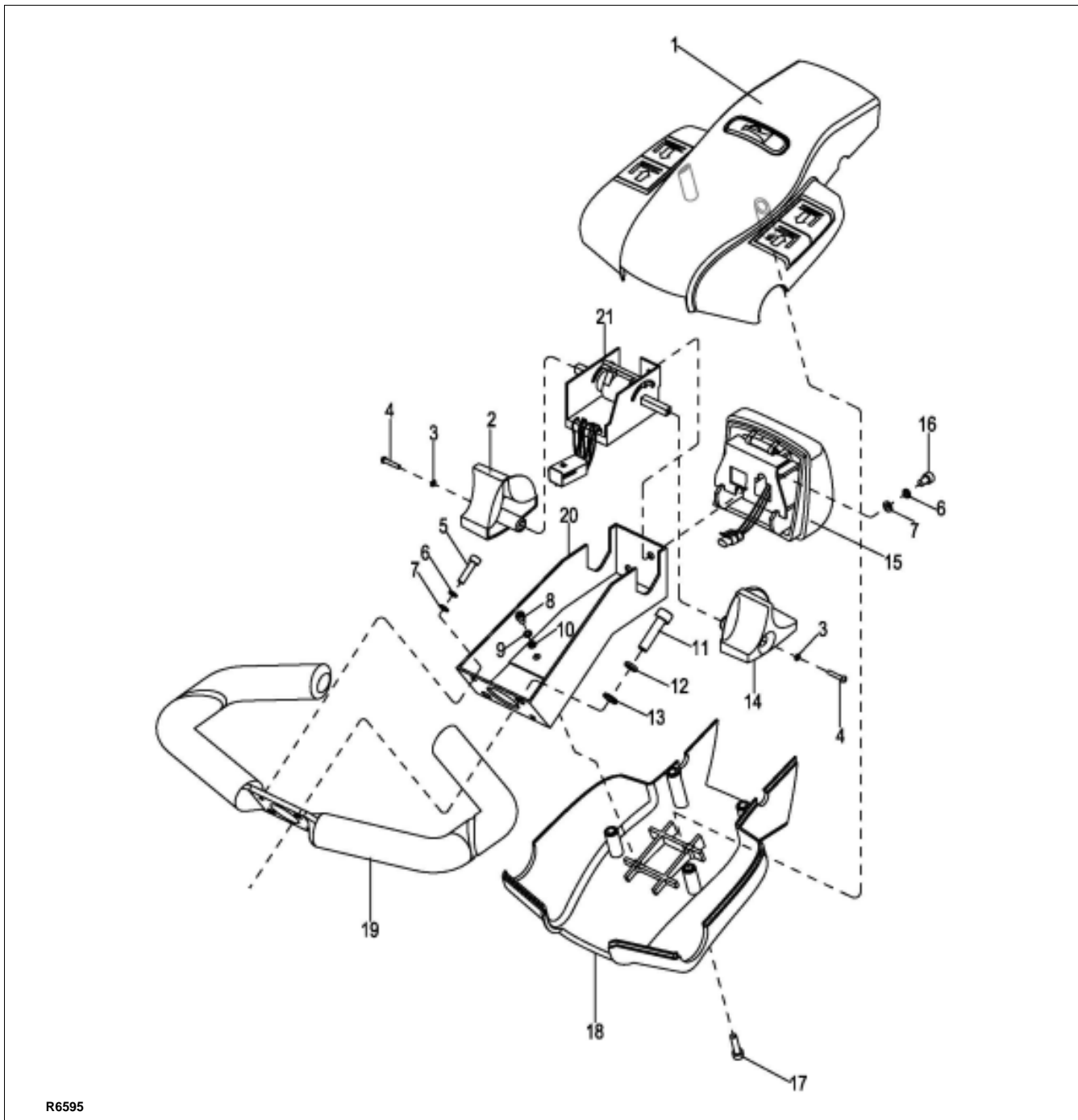


Figure 5-2 Control Head

5-1.2. Control Head Installation

1. Secure control head and handle (19, [Figure 5-2](#)) with two screws (11), two washers (12) and two flat washers (13).
2. Install two screws (5), two washers (6) and two flat washers (7).
3. Reconnect harness (15, [Figure 5-1](#)) to emergency reverse switch (15, [Figure 5-2](#)).
4. Reconnect harness (15, [Figure 5-1](#)) to potentiometer (21, [Figure 5-2](#)).
5. Install the cap assembly as described in paragraph [5-1.4](#).
6. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).

5-1.3. Cap Assembly Removal.

1. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
2. Remove four screws (17, [Figure 5-2](#)) and lift up cap assembly (1).
3. Disconnect harness (13, [Figure 5-4](#)) from harness (17, [Figure 12-17](#)) and remove cap assembly (1).

5-1.4. Cap Assembly Installation.

1. Hold cap assembly (1, [Figure 5-2](#)) in place and connect harness (10, [Figure 12-17](#)) to harness (9).
2. Position cap assembly (1, [Figure 5-3](#)) on control head and secure with four screws (6).
3. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).

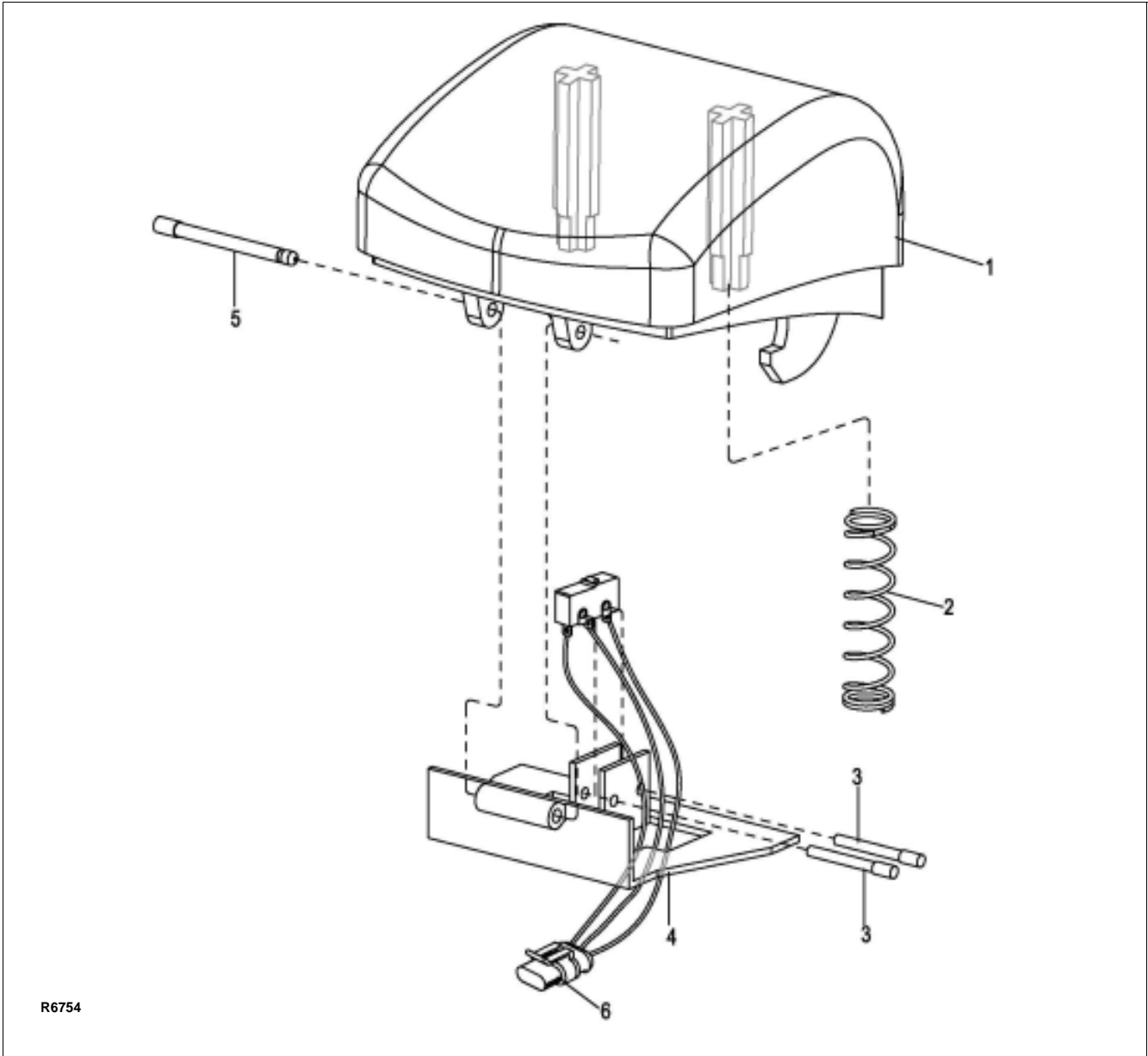
5-1.5. Speed Potentiometer Replacement.

1. Remove the cap assembly as described in paragraph [5-1.3](#).
2. Disconnect harness (15, [Figure 5-1](#)) from potentiometer (21, [Figure 5-2](#)).
3. Remove screw (4), washer (3) and control knob (2) from potentiometer (21).
4. Remove screw (4), washer (3) and control knob (14) from other side of potentiometer (21).

5. Remove two screws (16), lock washers (6) and flat washers (7) and remove potentiometer (21) from bracket (20).
6. Position new potentiometer (21) in bracket (20) and secure with two screws (16), lock washers (6) and flat washers (7).
7. Install control knob (2) on potentiometer (21) and secure with screw (4), and washer (3).
8. Install control knob (14) on the other side of potentiometer (21) and secure with screw (4), and washer (3).
9. Reconnect harness (15, [Figure 5-1](#)) from potentiometer (21, [Figure 5-2](#)).
10. Install the cap assembly as described in paragraph [5-1.4](#).

5-1.6. Belly-Button Switch Replacement.

1. Remove the cap assembly as described in paragraph [5-1.3](#).
2. Disconnect harness (15, [Figure 5-1](#)) from emergency disconnect switch (15, [Figure 5-2](#)).
3. Remove two screws (16), lock washers (6) and flat washers (7) and remove switch assembly (15) from bracket (20).
4. Remove pin (5, [Figure 5-3](#)), bracket (4), and spring (2) from button (1).
5. Remove two pins (3) and switch assembly (6) from bracket (4).
6. Position the new switch assembly (6) in bracket (4) and secure with two pins (3).
7. Position bracket (4) and springs (2) in button (1) and install pin (5).
8. Position switch assembly (15, [Figure 5-2](#)) on bracket (20) and secure with two screws (16), lock washers (6) and flat washers (7).
9. Reconnect harness (15, [Figure 5-1](#)) to emergency reverse switch (15, [Figure 5-2](#)).
10. Install the cap assembly as described in paragraph [5-1.4](#).



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Figure 5-3 Emergency Reverse Switch Assembly

5-1.7. Horn Switch Replacement.

1. Remove the cap assembly as described in paragraph 5-1.3.
2. Remove three screws (8, Figure 5-4), bracket (7) and two springs (9).
3. Remove two pins (10) and switch (6) from bracket (7).
4. Unsolder harness (13) from switch (6).
5. Solder harness (13) to new switch (6).
6. Position new switch (6) in bracket (7) and secure with two pins (10).
7. Position bracket (7) with two springs (9) in cover (1) and secure with three screws (8).
8. Install the cap assembly as described in paragraph 5-1.4.

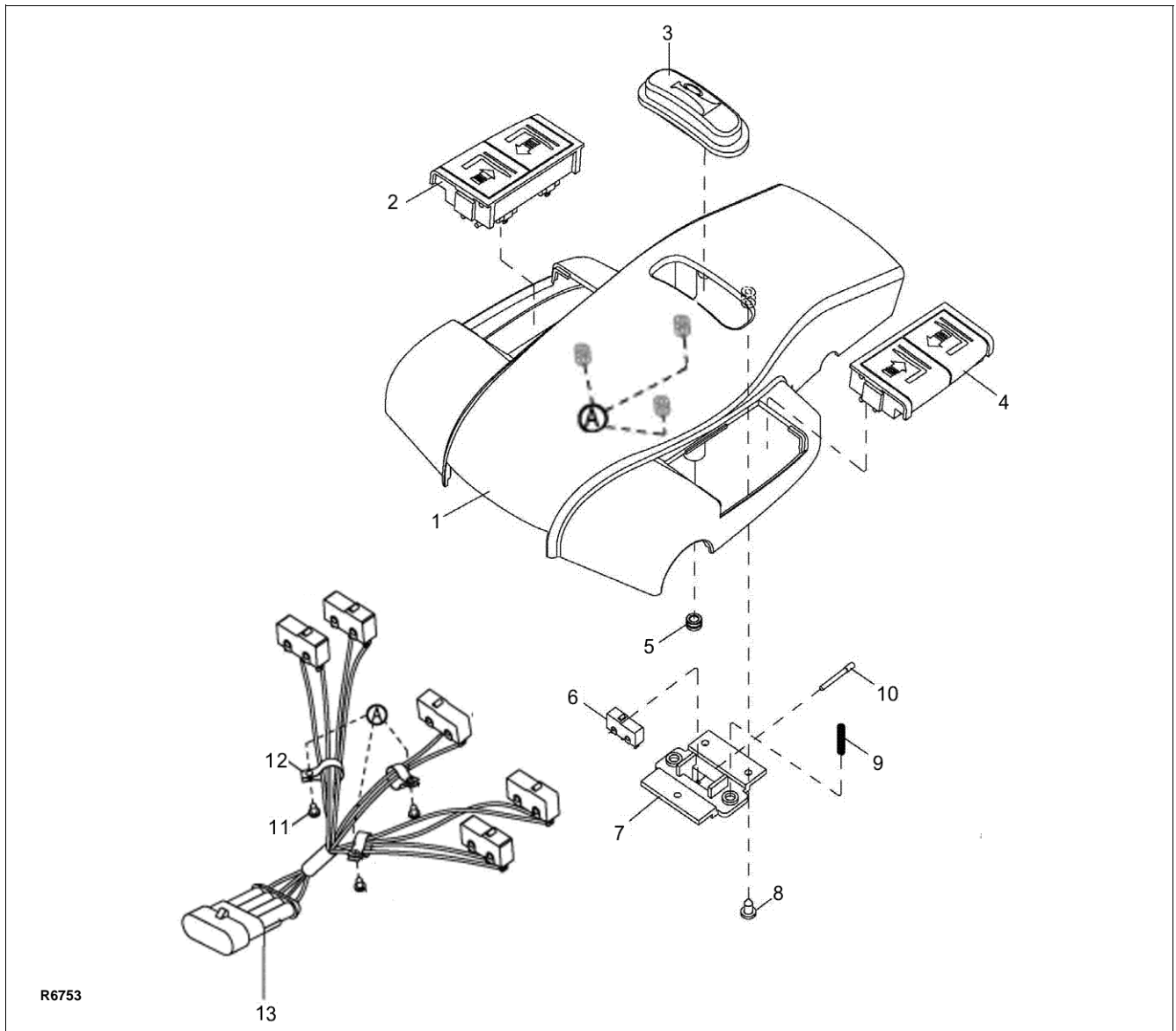


Figure 5-4 Cap Assembly

5-1.8. Lift and Lower Switch Replacement.

1. Remove the cap assembly as described in paragraph 5-1.3.
2. Remove switch assembly (2 or 4, Figure 5-4) from the cap (1)
3. Remove pin (3, Figure 5-5) securing buttons (1 and 6) to bracket (4) and remove the buttons.
4. Remove two pins (3), two switches (2) and four springs (5) from bracket (4).
5. Unsolder harness (13, Figure 5-4) from defective switch (2, Figure 5-5).
6. Solder the harness to new switch (2).
7. Position switches (2) and four springs (5) in bracket (4) and secure with two pins (3).
8. Position switch assembly (2 or 4, Figure 5-4) in cover (1) and secure with pin (3, Figure 5-5).
9. Install the cap assembly as described in paragraph 5-1.4.

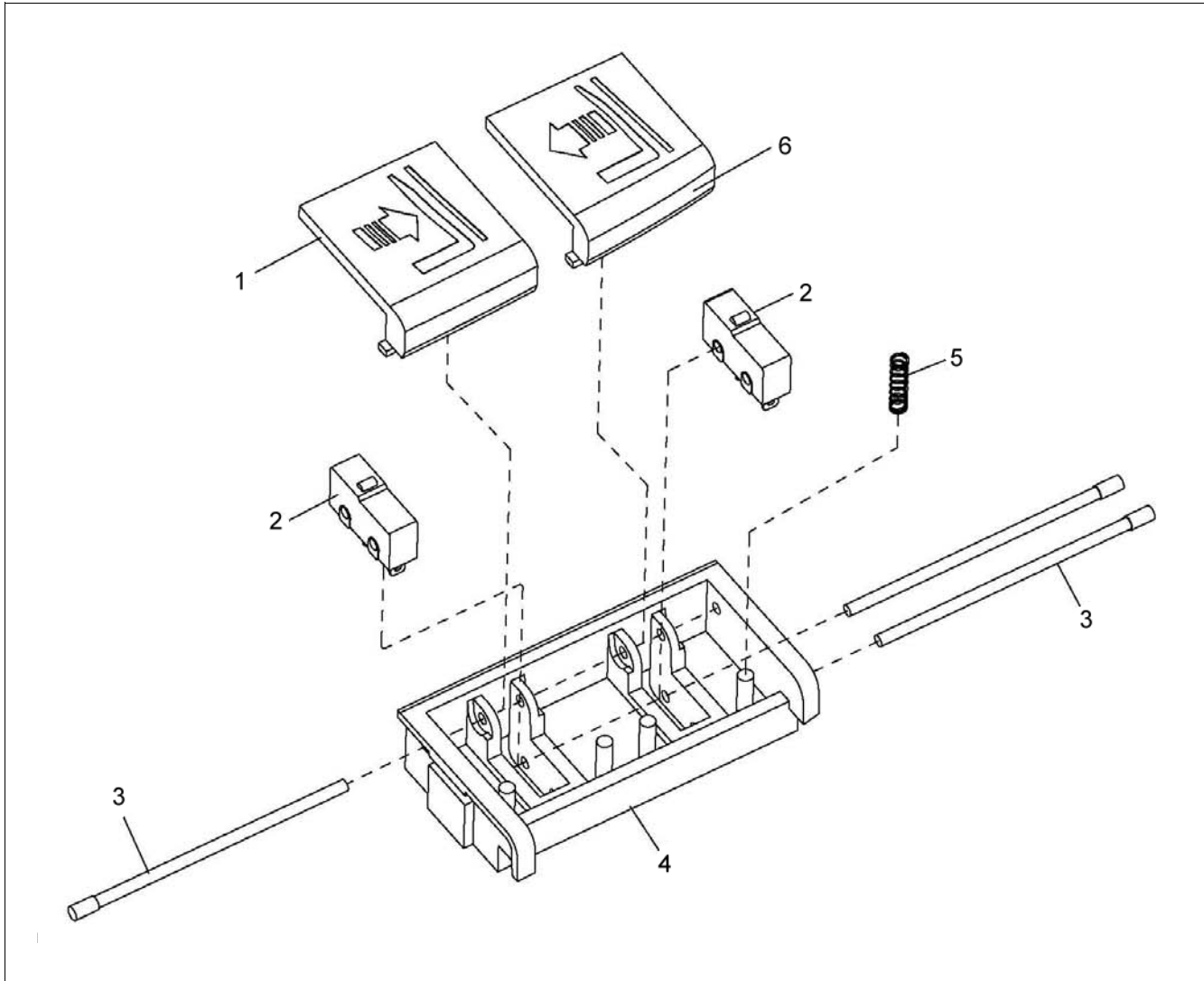


Figure 5-5 Left Lift/Lower Switch Assy (Right Similar)

5-2. UPPER COMPARTMENT COVERS

5-2.1. Removal.

1. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
2. Pull cable (3, [Figure 5-6](#)) up and remove cap (4) from the cable. Let cable (3) back down into cover (6).
3. Remove two screws (5) and cover (6).
4. Disconnect cable (3) from the battery charger.
5. Remove two side covers (7).

5-2.2. Installation.

1. Install two side covers (7, [Figure 5-6](#)).
2. Reconnect cable (3) to the battery charger.
3. Feed cable (3) through cover (6) and position cover (6) on frame (9). Secure with two screws (5).
4. Install cap (4) on cable (3) and position the cap on cover (6).
5. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).

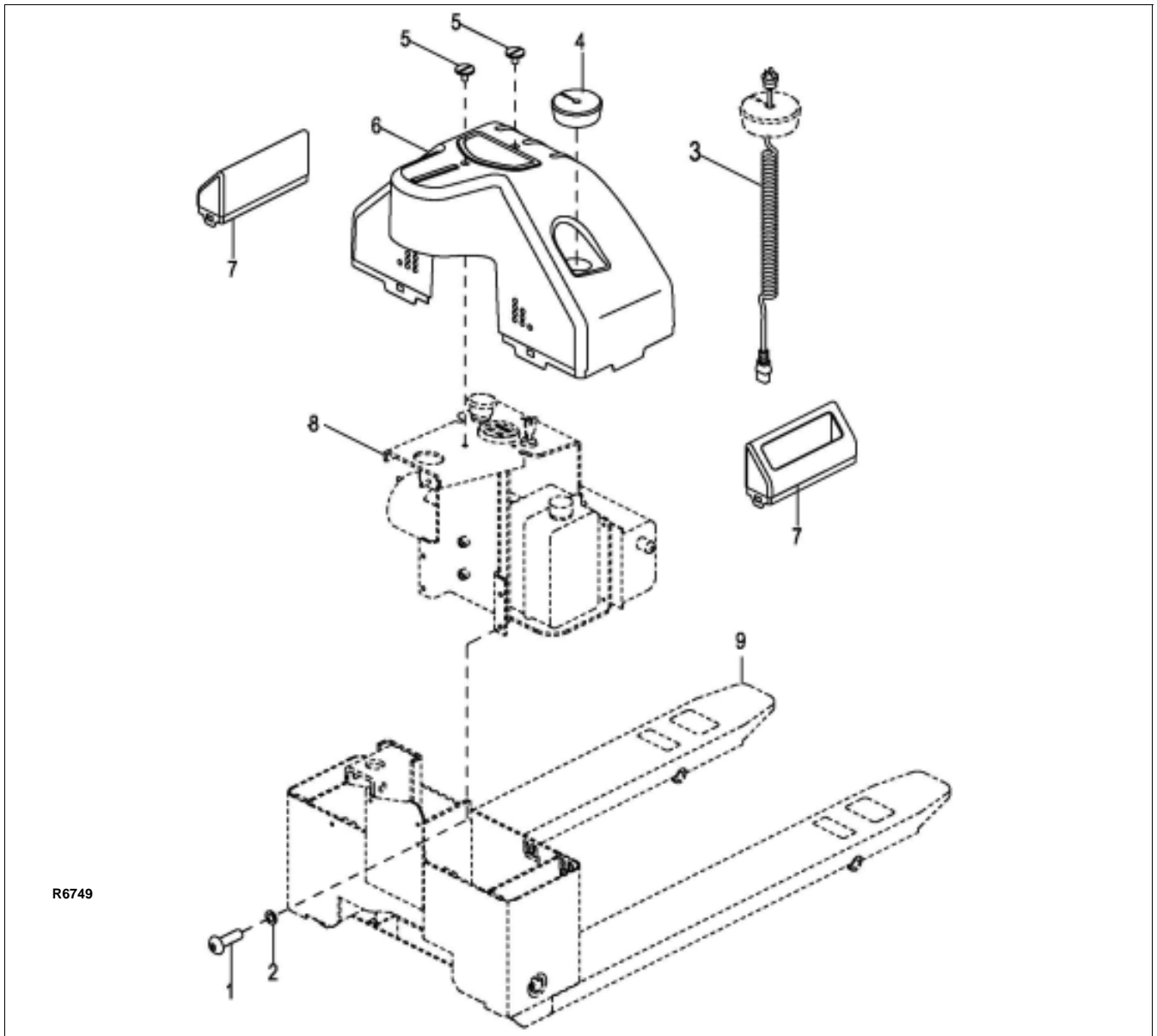


Figure 5-6 Compartment Cover

5-3. LOWER COMPARTMENT COVERS

5-3.1. Removal.

1. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
2. Lift cover (7, [Figure 5-7](#)) up and off cover (9).
3. Remove four screws (8), cover (9) and skids (5 and 6) from transmission (11).

5-3.2. Installation.

1. Position skids (5 and 6, [Figure 5-7](#)) and cover (9) on transmission (11) and secure with four screws (8).
2. Position cover (7) on top of cover (9) engaging the clips.
3. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).

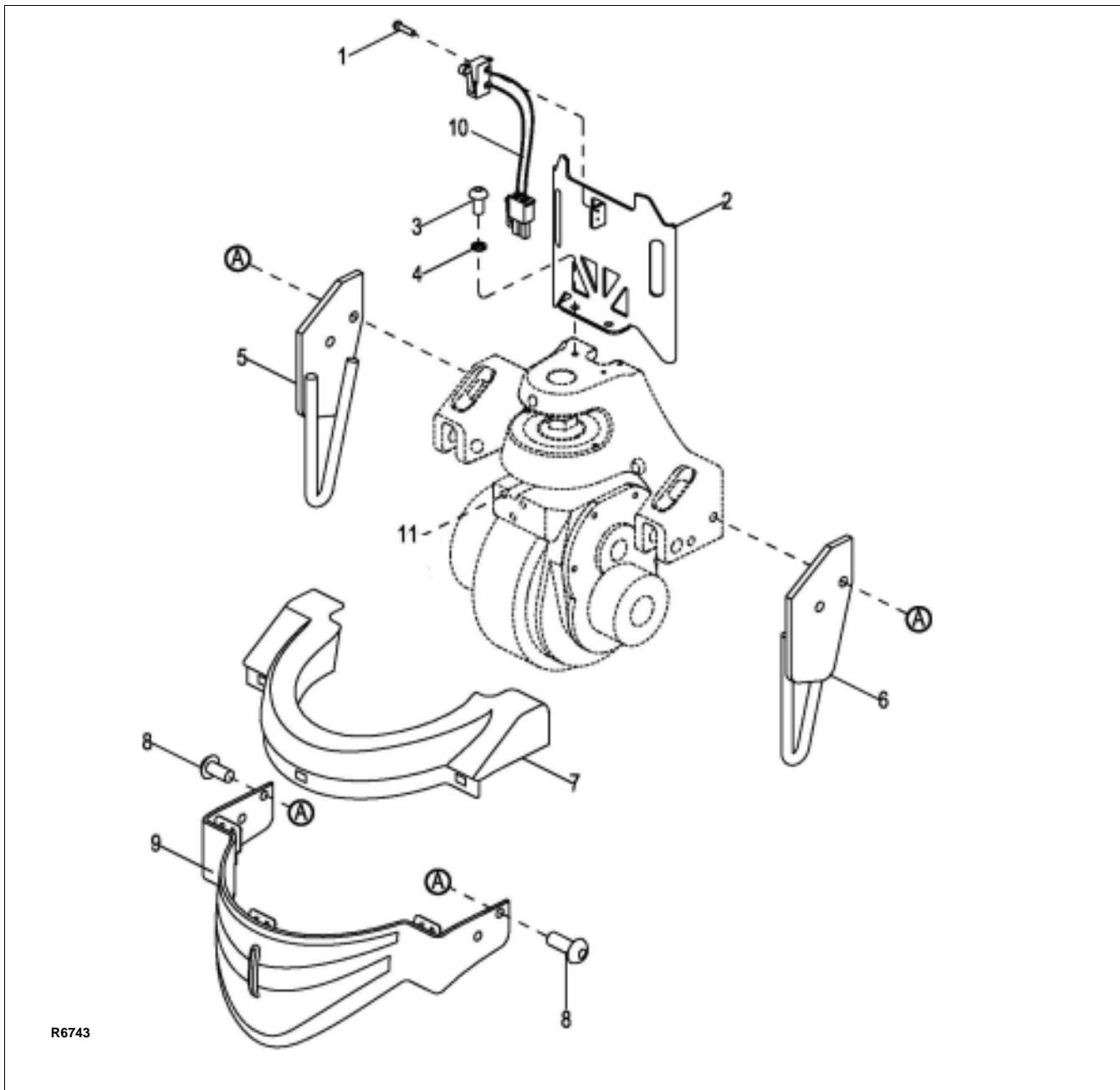


Figure 5-7 Compartment

5-4. STEERING ARM

5-4.1. Return Spring Replacement.

The steering arm gas return spring (6, [Figure 5-2](#)) is replaced while the steering arm (5) is in the upright position.

1. Secure the steering arm (13, [Figure 5-1](#)) in the upright position.
2. Remove screw (1) and free the gas return spring (8) from bracket (5).
3. Pull downward on the gas return spring (8) to free it from its seat inside steering arm (13).
4. Position the new gas return spring (8) inside the steering arm being sure it fully engages its seat.
5. Position the opposite end of the gas return spring (8) on bracket (5) and install screw (1).

5-4.2. Steering Arm Removal.

1. Remove steering arm gas return spring as described in paragraph [5-4.1](#).
2. Disconnect harness (15, [Figure 5-1](#)) from harness (13, [Figure 12-17](#)).
3. Attach a hoist to steering arm (13, [Figure 5-1](#)).
4. Remove shaft (9) and the steering arm (13).

5-4.3. Steering Arm Installation.

1. Position steering arm (13, [Figure 5-1](#)) over bracket (5) and secure with shaft (9).
2. Reconnect harness (15, [Figure 5-1](#)) to harness (13, [Figure 12-17](#)).
3. Install steering arm gas return spring as described in paragraph [5-4.1](#).

NOTES

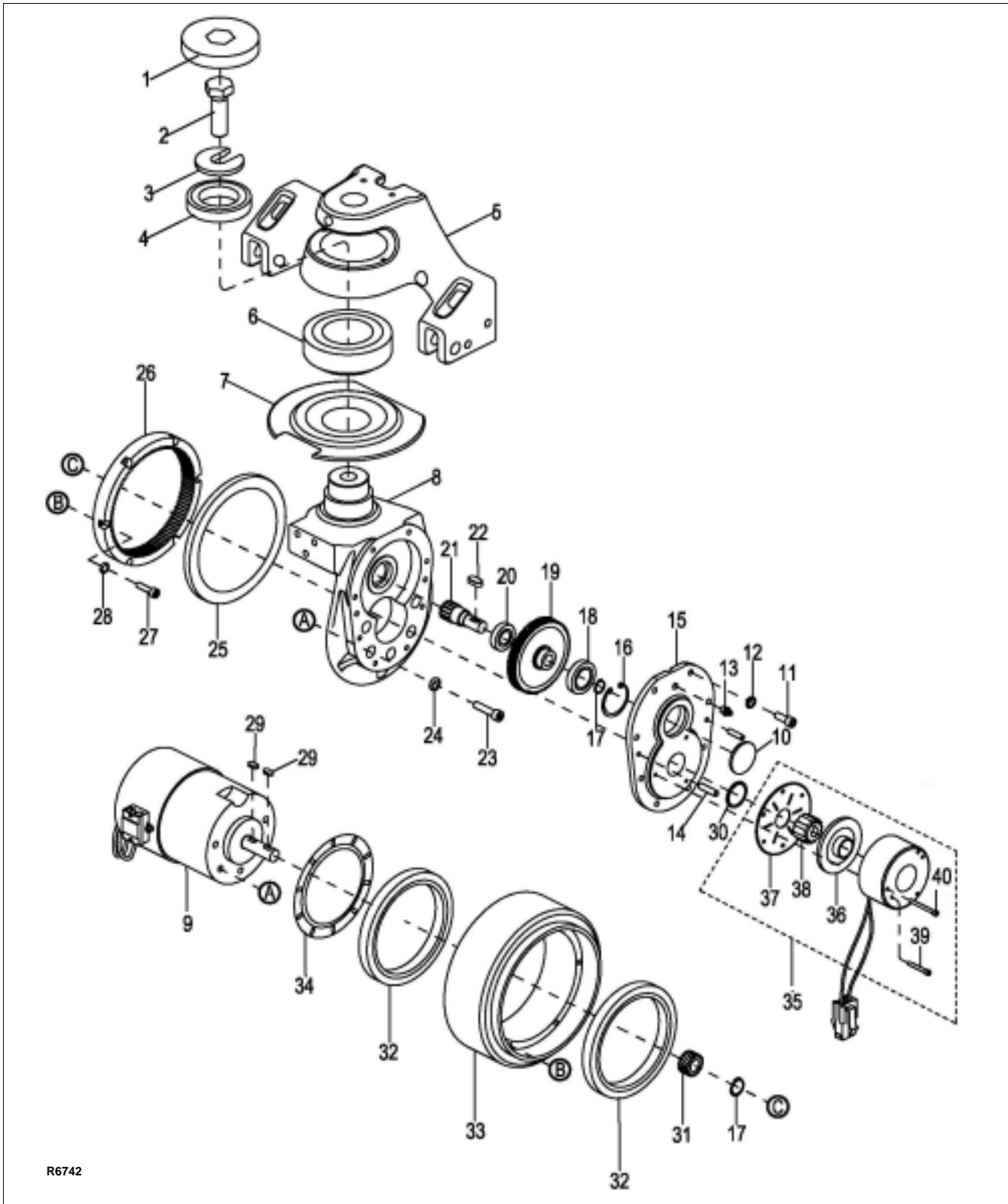
SECTION 6 BRAKE SERVICING

6-1. BRAKES.

The brake system consists of a transmission mounted brake. This brake is spring applied and electrically released.

6-1.1. Brake Assembly Replacement

1. Block load wheels.
2. Remove the lower compartment covers as described in paragraph 5-3.
3. Disconnect electric brake (6, [Figure 12-17](#)) from harness (4).
4. Remove the three mounting screws (39, [Figure 6-1](#)) and the brake.
5. Place the new brake into position and secure with the three mounting screws.
6. Reconnect electric brake (6, [Figure 12-17](#)) to harness (4).
7. Remove load wheel blocks and check operation.
8. Install the lower compartment covers as described in paragraph 5-3.



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Figure 6-1 Transmission, Motor, Brake Mounting

SECTION 7

TRANSMISSION, DRIVE WHEEL, LOAD WHEEL

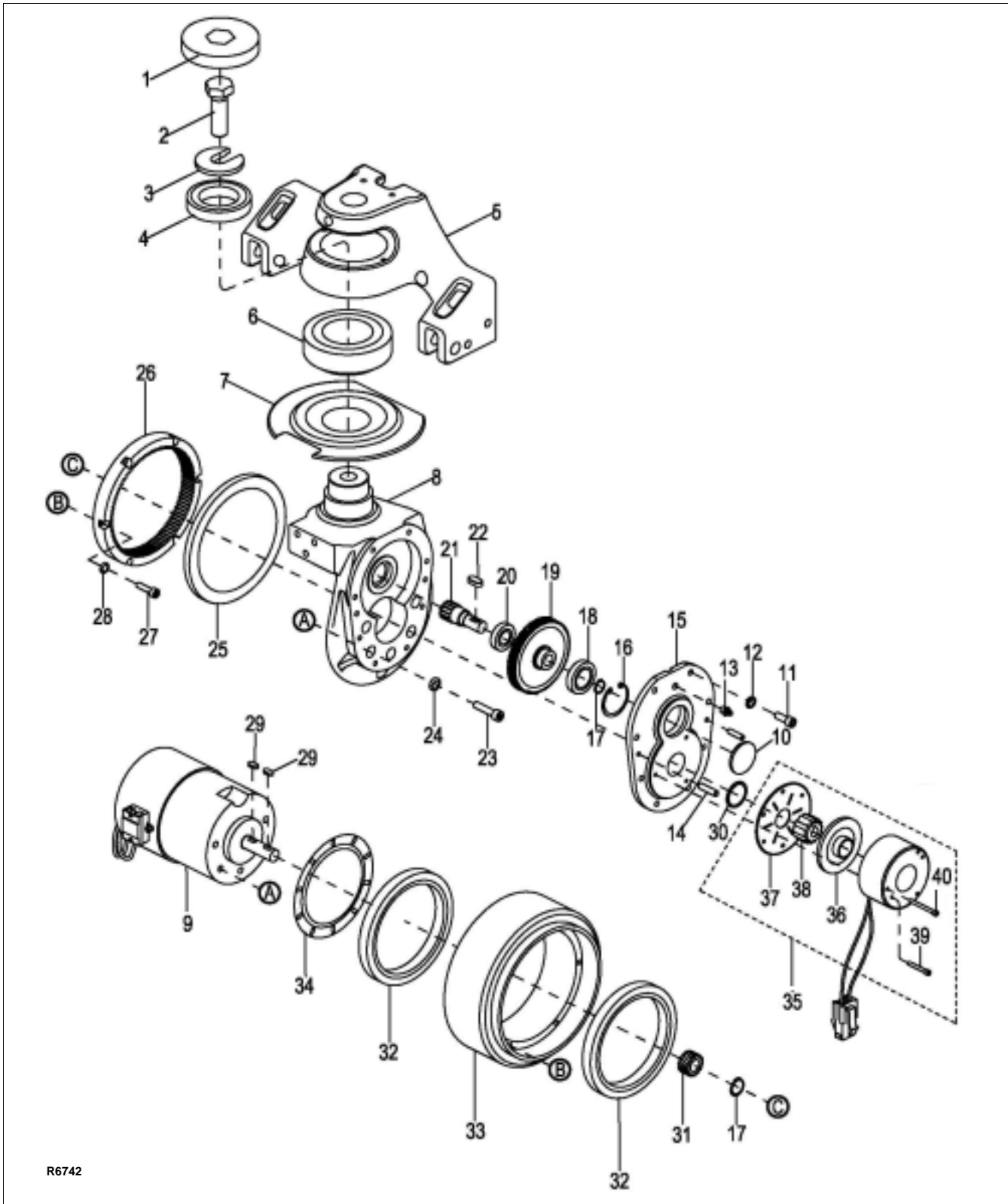
7-1. Drive Wheel.

1. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
2. Remove the lower compartment covers as described in paragraph [5-3](#).
3. Jack up the truck so the drive wheel is off the ground; then securely block the truck to prevent movement.
4. Disconnect cables (3 and 4, [Figure 12-18](#)) from drive motor.
5. Remove five screws (23, [Figure 7-1](#)), lock washers (24), and free motor (9) with drive wheel (33) from housing (8).
6. Remove the six screws (27), six lock washers (28) and gear (26).
7. Remove drive wheel (33) from motor (9).
8. Remove bearing (32) from wheel (33).
9. Install new drive wheel in reverse order of removal.
10. Install the lower compartment covers as described in paragraph [5-3](#).

11. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).

7-2. Transmission.

1. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
2. Remove the lower compartment covers as described in paragraph [5-3](#).
3. Remove the brake (35, [Figure 7-1](#)) as described in paragraph [6-1.1](#).
4. Remove the steering arm as described in paragraph [5-4.2](#).
5. Remove two screws (3, [Figure 12-1](#)) and plate (4).
6. Remove three screws (1), three lock washers (4) and bracket (5) from housing (8, [Figure 7-1](#)).
7. Support the housing (8) and remove bolt (2) and plate (3)
8. Free housing (8) from frame (5).
9. Remove plate (7) from housing (8).
10. Install new transmission by reversing the steps above.



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Figure 7-1 Transmission, Motor, Brake Mounting

7-3. Load Wheel.

7-3.1. Removal

1. Raise forks.
2. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
3. Block the drive wheel to prevent the truck from rolling.
4. Jack up the forks to raise the load wheels off the floor. Securely block the forks in the raised position by positioning supports under both fork tips.

NOTE: When shaft (12, [Figure 12-11](#)) is removed, load wheel assembly (13) will drop free.

5. Remove pin (11) securing shaft (12) and remove shaft (12) and load wheel assembly (13).

NOTE: Inspect the load wheel assembly. If the load wheel is worn within 1/8" of the metal sleeve, or is cracked or damaged, replace the entire load wheel and bearing assembly. Big Lift LLC recommends that both load wheel assemblies be replaced at the same time. This ensures level and safe operation of the lift truck.

7-3.2. Repair

1. Remove bearings (1, [Figure 7-2](#)) from wheels (2).
2. Inspect bearings (1) and replace if necessary.
3. Reassemble bearings (1) in wheels (2).

7-3.3. Load Wheel Installation

1. Position load wheel assembly (13, [Figure 12-11](#)) in wheel bracket (12).
2. Install shaft (12) and secure with pin (11).
3. Remove blocking from under the truck.
4. Lower the forks.
5. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).

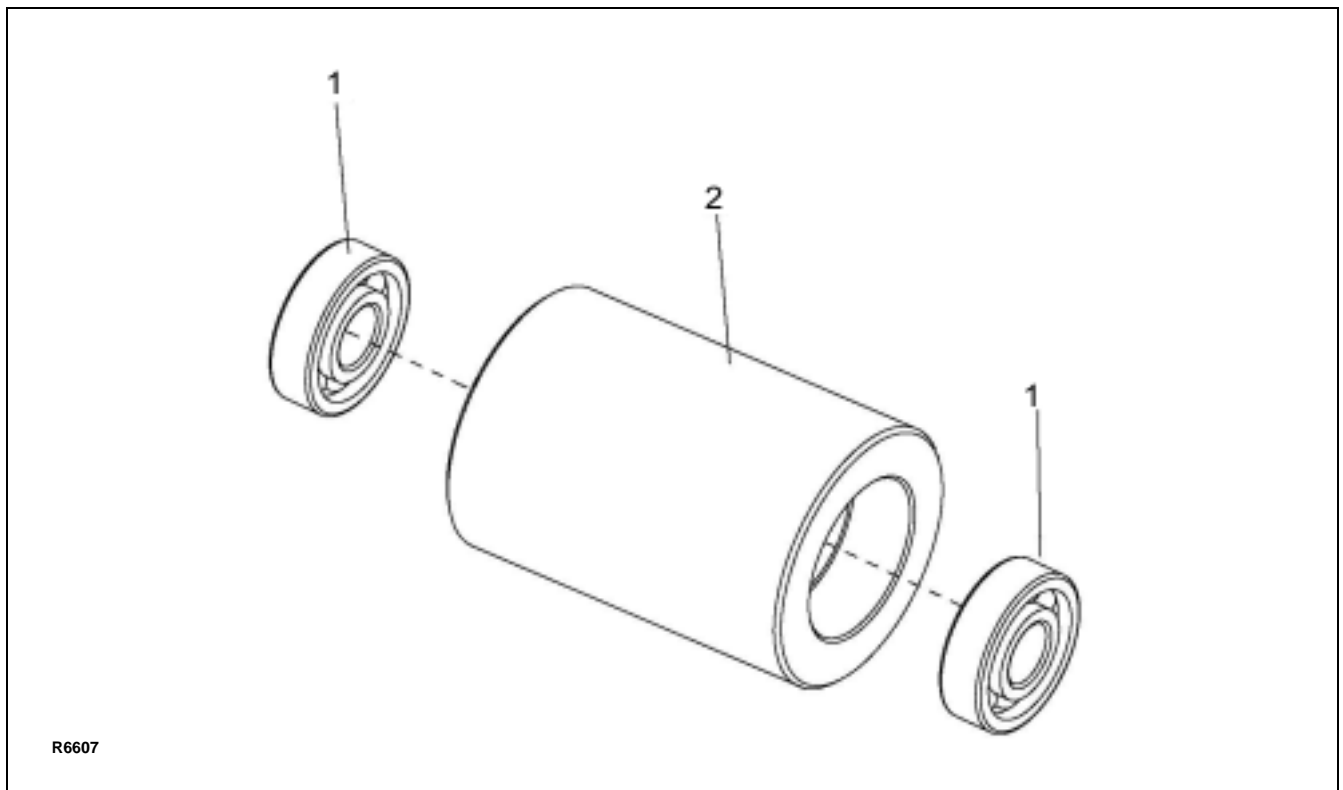


Figure 7-2 Wheel Assembly

NOTES

SECTION 8 ELEVATION SYSTEM SERVICING

8-1. LIFT LINKAGE

8-1.1. Removal

1. Lift complete truck to height sufficient to permit access to lift linkage under forks. Provide blocking under frame (8, [Figure 8-1](#)), transmission (13) and at tips of the forks.
2. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
3. Remove pins (10, [Figure 8-1](#)) and remove shafts (11).
4. Remove clips (3) from each side of frame (8). Support link assembly (14) and remove shaft (9).
5. Remove pins (7) and remove shafts (6).
6. Lower link assembly (14) to the floor.

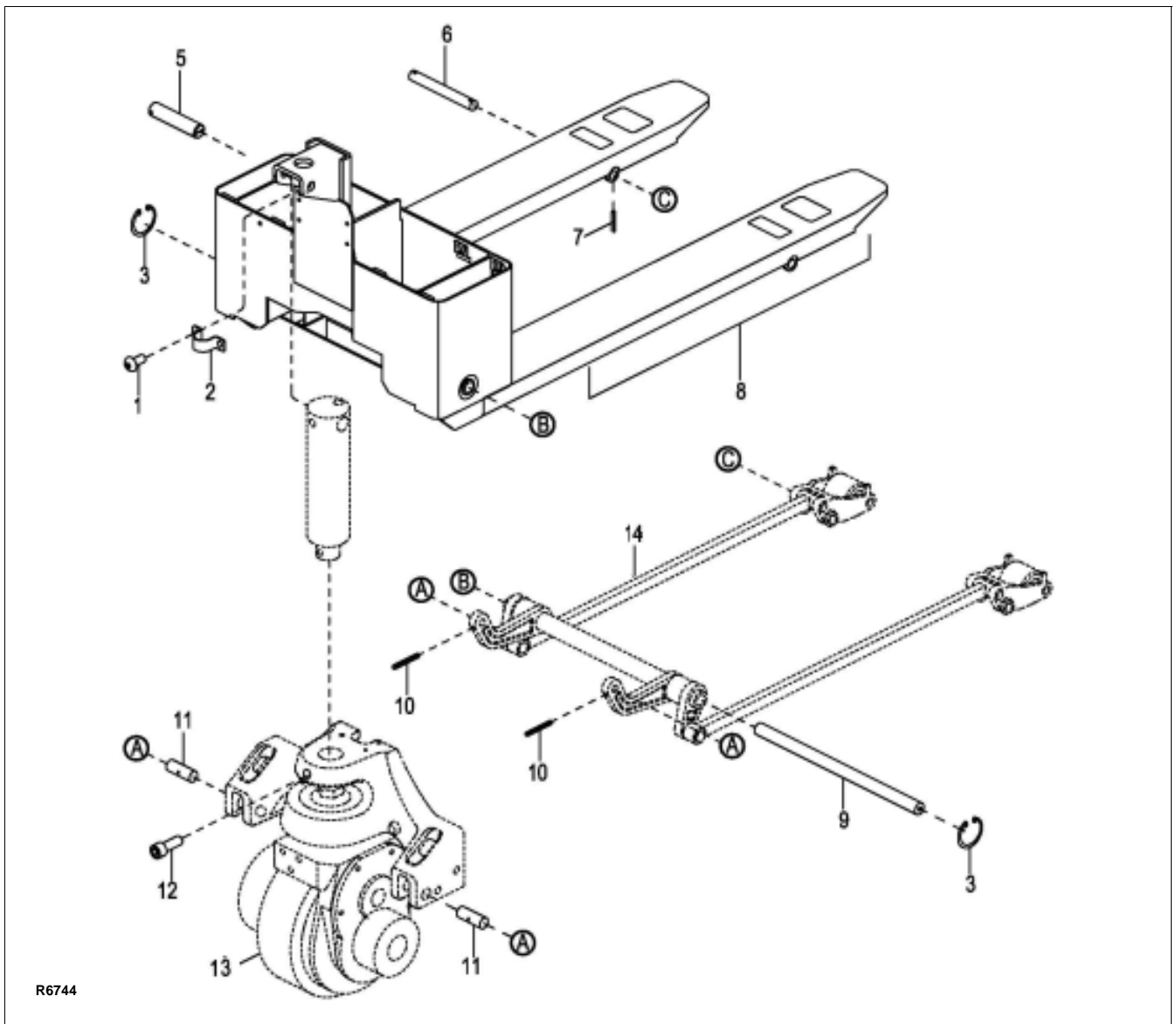


Figure 8-1 Frame

8-1.2. Repair

1. Remove pins (11, [Figure 8-2](#)), shafts (12) and load wheel (13) from wheel brackets (8).
2. Remove pins (11) and shafts (10). Free brackets (8) from tension bars (6).
3. Remove bushings (9) from brackets (8) if replacement is necessary,
4. Remove clips (2) from link (1) and free tension bars from link (1).
5. Loosen nuts (5) and remove clevises (3) from tension bars (6).
6. Remove bushings (4) from clevises (3) if replacement is necessary.
7. Position bracket (12) in the fork and install pin (9).
8. Install reassembly by reversing the steps above.

8-1.3. Installation

1. Position link assembly (14, [Figure 8-1](#)) under frame (8).
2. Raise each link assembly (14) into position and install shaft (9) through frame (8). Secure shaft (9) with clips (3).
3. Position wheel brackets (8, [Figure 8-2](#)) in frame (8, [Figure 8-1](#)) and install shafts (6). Secure shafts (8) with pins (7).
4. Position link assembly (14) and install shafts (11). Secure shafts (11) with pins (10),
5. Remove blocking and lower the truck to the ground.
6. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).

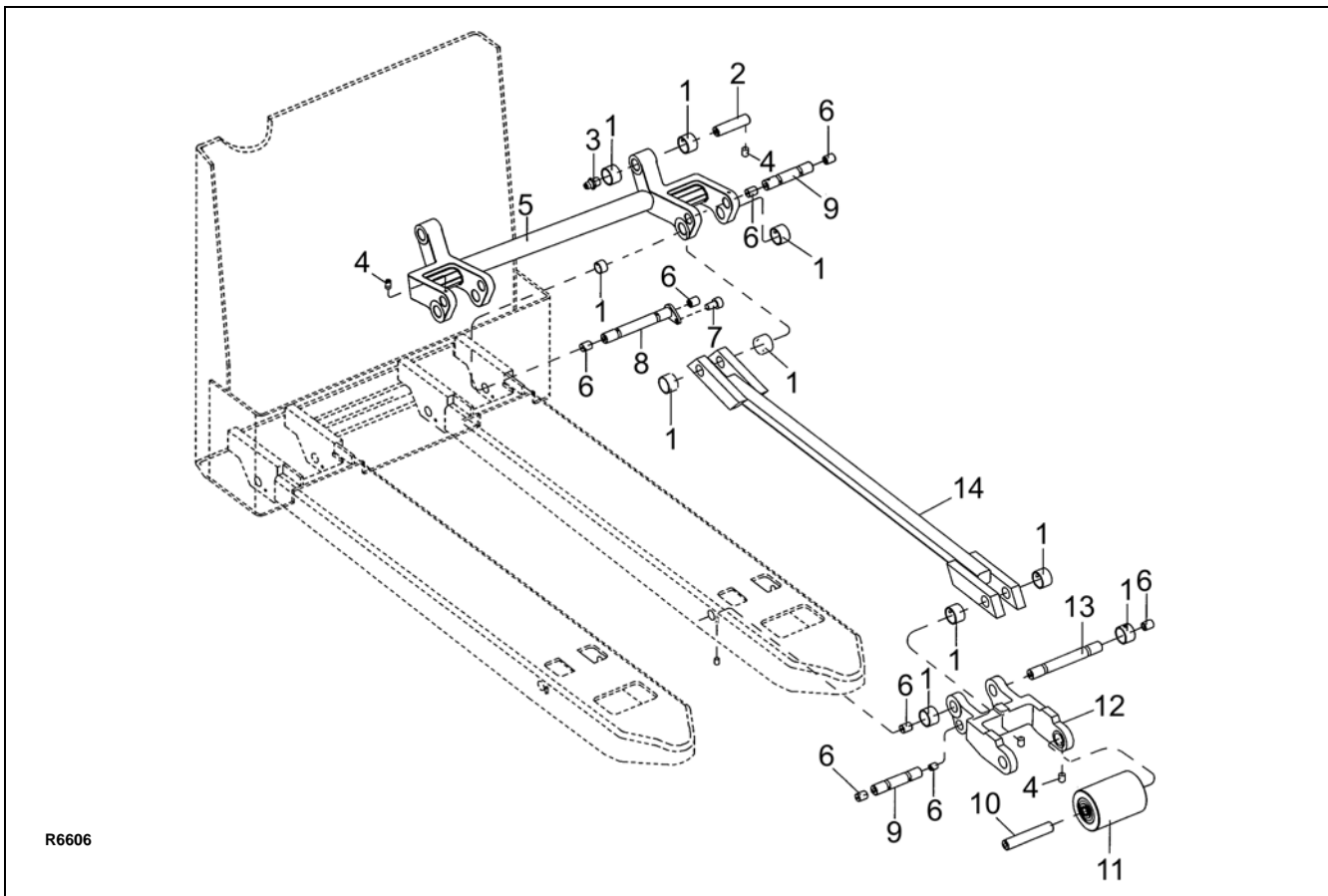


Figure 8-2 Lift Linkage Assembly

SECTION 9 HYDRAULIC SYSTEM SERVICING

9-1. LINES AND FITTINGS

WARNING: When forks are raised, pressure exists in the hydraulic system lines and fittings. To ensure release of pressure, forks must be fully lowered before performing any maintenance on the hydraulic system.

NOTE: Leaking hydraulic fittings may be remedied by simply tightening fittings. If this does not remedy the leak, the fittings or line must be replaced.

1. Lower forks fully.
2. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
3. Remove the upper compartment cover (6, [Figure 9-1](#)) as described in paragraph 5-2.

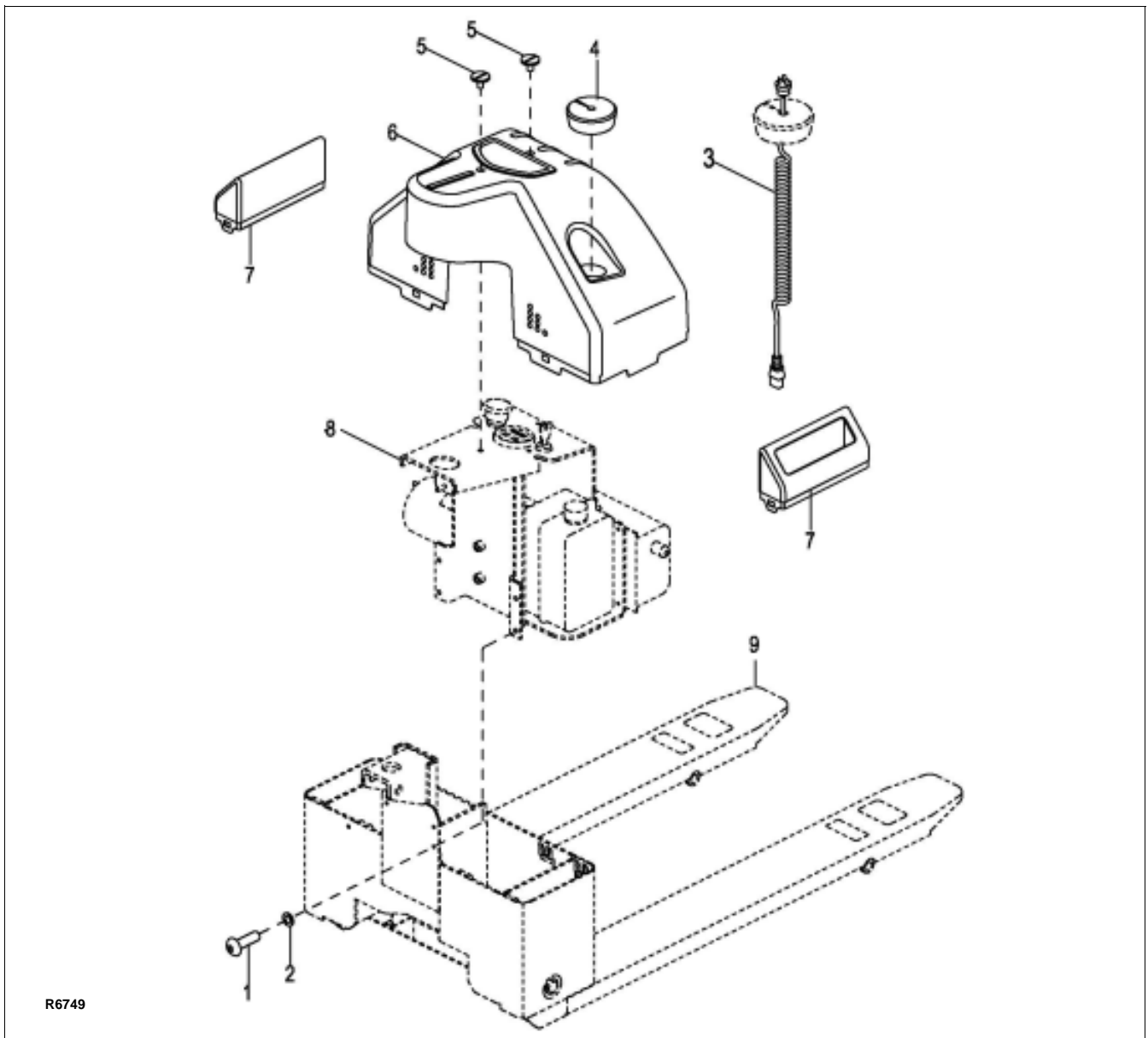


Figure 9-1 Compartment Cover

CAUTION: Hydraulic oil can damage parts. Wipe off any oil immediately. Provide a container under the line or fitting before disconnecting.

4. Refer to [Figure 9-2](#) and remove leaking line or fitting and replace it with a new line or fitting. Check level of hydraulic oil. With lift carriage fully lowered, fill reservoir with hydraulic oil to 1 inch below opening. Use hydraulic oil listed in [Table 3-2](#).
5. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
6. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
7. Check level of hydraulic oil. Hydraulic oil must be 1 inch below opening. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-2](#).
8. Install the upper compartment cover as described in paragraph [5-2](#).

9-2. HYDRAULIC AND ELECTRICAL ASSEMBLY REMOVAL

The hydraulic system and electrical system can be removed as an assembly to provide additional clearance for various maintenance procedures.

WARNING: When forks are raised, pressure exists in the hydraulic system lines and fittings. To ensure release of pressure, forks must be fully lowered and the batteries disconnected before performing any maintenance on the hydraulic system.

9-2.1. Removal

1. Lower forks fully.
2. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
3. Remove the upper compartment cover (6, [Figure 9-1](#)) as described in paragraph [5-2](#).
4. Remove four screws (1, [Figure 9-1](#)), four washers (2) and move assembly (8) away from frame (9).

9-2.2. Installation

1. Position assembly (8) on frame (9) and secure with four screws (1, [Figure 9-1](#)), and four washers (2).
2. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
3. Install the upper compartment cover as described in paragraph [5-2](#).

9-3. HYDRAULIC PUMP, MOTOR, AND RESERVOIR ASSY

The hydraulic pump/motor assembly can be disassembled and repaired. However, a defective pump, valve or motor requires replacement of that component.

WARNING: When forks are raised, pressure exists in the hydraulic system lines and fittings. To ensure release of pressure, forks must be fully lowered and the batteries disconnected before performing any maintenance on the hydraulic system.

9-3.1. Removal

1. Lower forks fully.
2. Turn off the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
3. Remove the hydraulic and electrical assembly (8, [Figure 9-1](#)) as described in paragraph [9-2](#).
4. Tag and disconnect electrical leads from solenoid (2, [Figure 9-3](#)) and motor (3)

NOTE: The reservoir and hose will be filled with hydraulic oil. Place a container under the pump assembly to catch any hydraulic oil.

5. Remove bolt (9, [Figure 9-2](#)) and washers (7) and disconnect hose (6) pump and motor (11).
6. Remove two screws (1) and remove pump and motor (11).

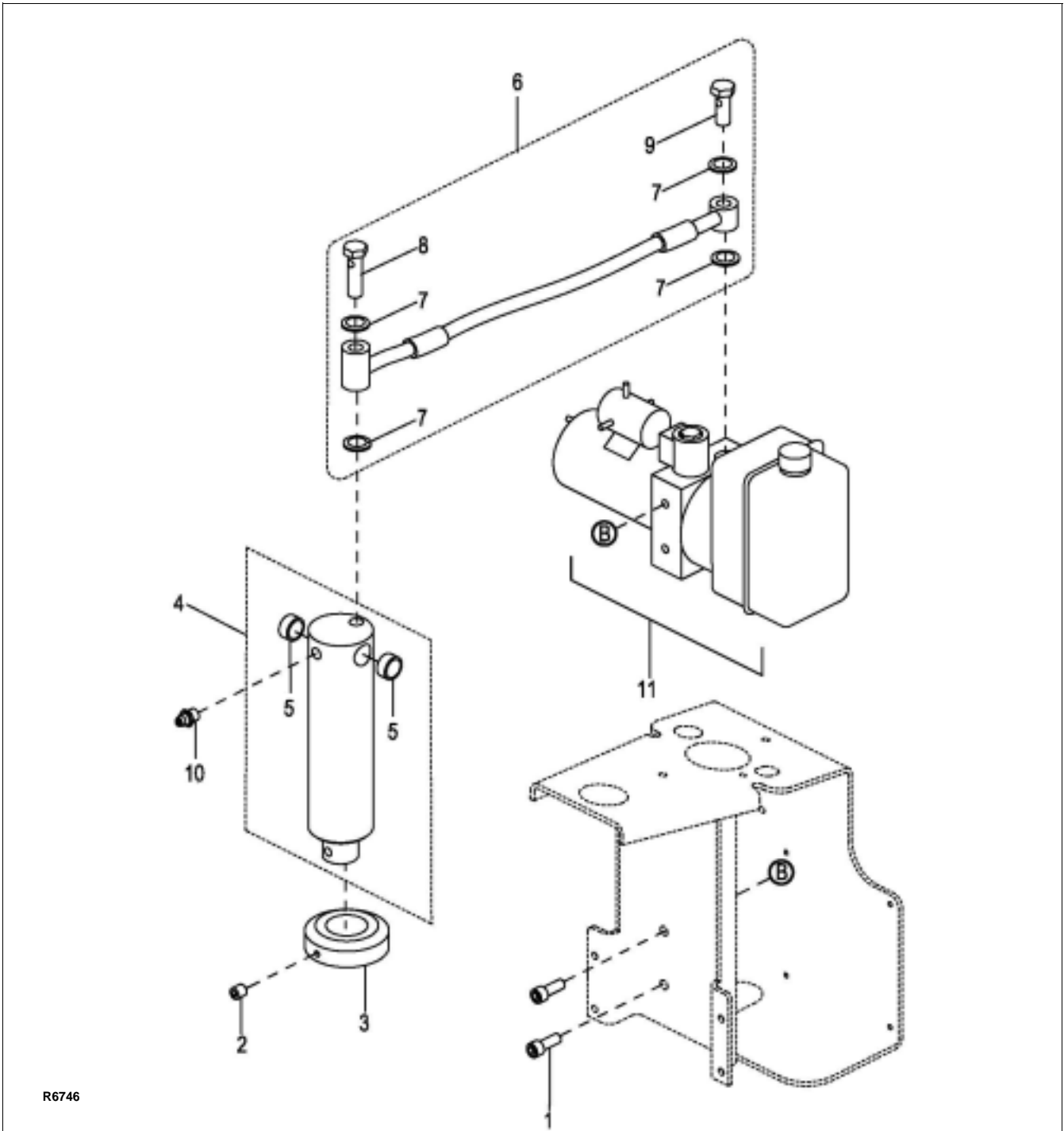
9-3.2. Disassembly and Reassembly

1. Remove the hydraulic pump/motor assembly as described in paragraph [9-3.1](#).
2. Refer to [Figure 9-3](#) for disassembly and reassembly.

9-3.3. Installation

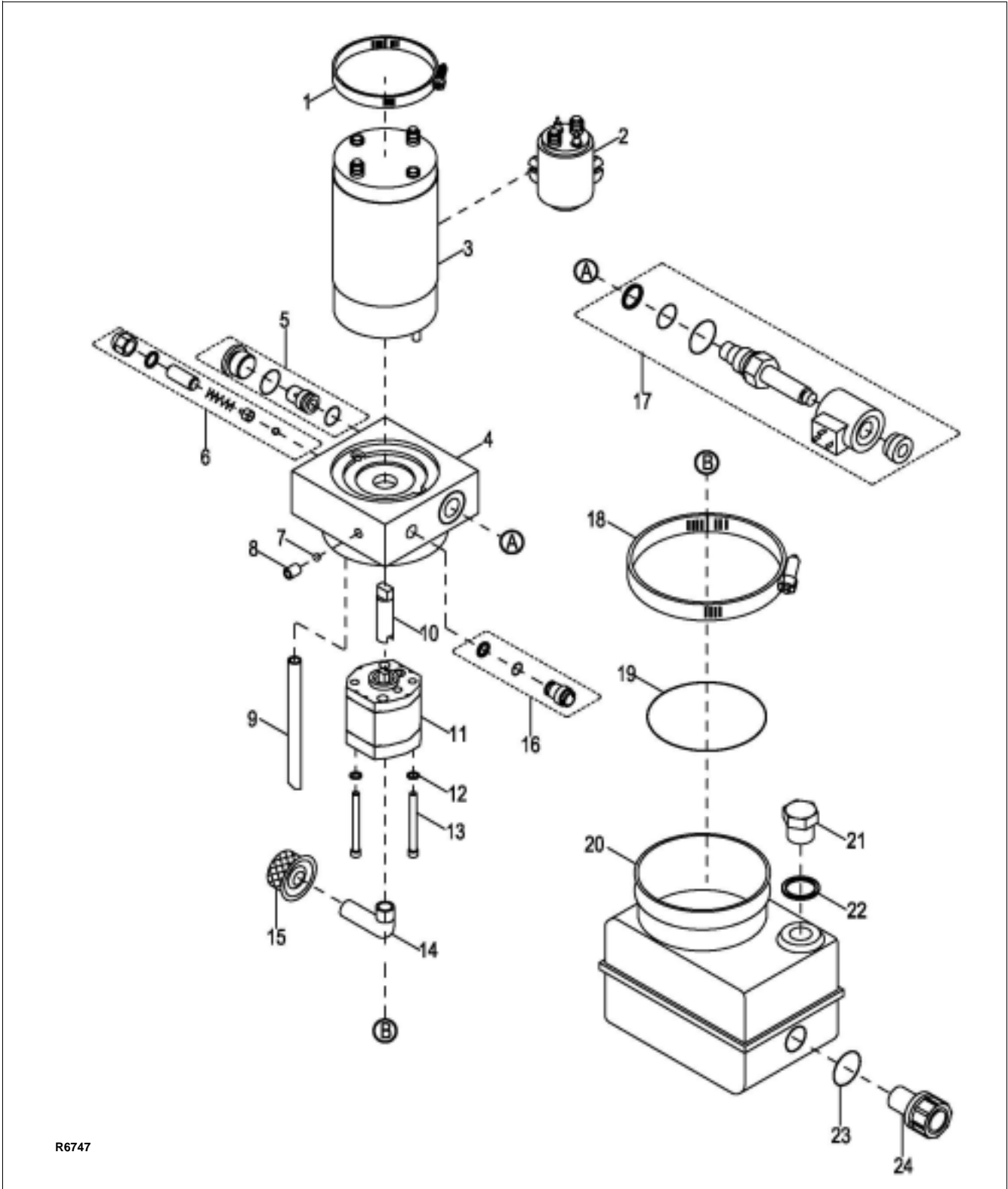
1. Position pump and motor (11, [Figure 9-2](#)) on bracket and secure with two screws (1).
2. Connect electrical leads to motor (3, [Figure 9-3](#)) and solenoid (2).
3. Reconnect hose (6, [Figure 9-2](#)) to pump/motor assembly (11) with two washers (7) and bolt (9).
4. Fill the hydraulic reservoir. Hydraulic oil must be 1 inch below opening. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-2](#).
5. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).

6. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
7. Check level of hydraulic oil. Hydraulic oil must be 1 inch below opening. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-2](#).
8. Install the compartment cover as described in paragraph 5-2.



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Figure 9-2 Hydraulic System



R6747

Figure 9-3 Pump & Motor Assy

9-3.4. Lift Cylinder

9-3.4.1. Removal

1. Lower forks fully.
2. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
3. Remove the upper compartment covers as described in paragraph [5-2](#).
4. Ensure that hydraulic pressure has been relieved from the lift circuit. Disconnect the hydraulic line from the lift cylinder.
5. Remove screw (8, [Figure 9-2](#)) and washers (7) and disconnect hose (6,) from cylinder (4).
6. Remove screw (12, [Figure 12-10](#)) securing the cylinder to frame.

WARNING: Frame is heavy. Use care while securing and lifting in order to prevent injury.

7. With suitable hoist, carefully raise frame (8) slightly so the cylinder can be removed.

9-3.4.2. Repair

1. Secure the lift cylinder in a vise, clamping lightly at the base of the cylinder.
2. Unscrew gland nut (4, [Figure 9-4](#)) from body (5).
3. Remove wiper (2) and O-ring (3) from gland nut (4).
4. Withdraw the cylinder rod (1) from body (5).
5. Remove guide ring (6) and seal ring (7) from rod (1).

NOTE: If the cylinder body (5) or piston rod (1) are damaged, the entire lift cylinder must be replaced.

6. Replace guide ring (6), seal ring (7), wiper ring (2) and O-ring (3).
7. Coat all parts with hydraulic oil ([Table 3-2](#)).
8. Install new guide ring (6) and seal ring (7) on rod (1).
9. Insert piston rod (1) into body (5).
10. Install wiper (2) and O-ring (3) in gland nut (4).
11. Install gland nut (4, [Figure 9-4](#)) in body (5).

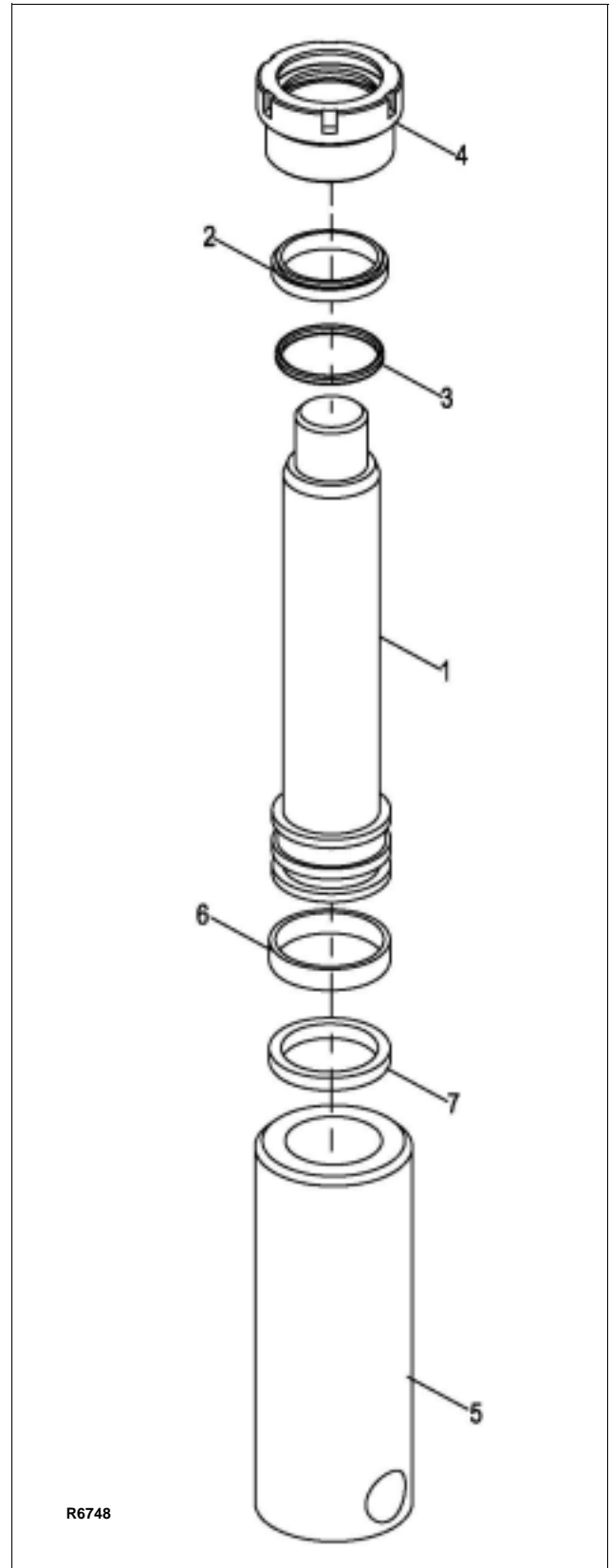


Figure 9-4 Lift Cylinder

9-3.4.3.Installation

1. Position the cylinder on frame and secure with screw (12, [Figure 12-10](#)). Then lower the frame (8) onto the cylinder.
2. Reconnect the hose (6, [Figure 9-2](#)) to cylinder (4) with screw (8, [Figure 9-2](#)) and washers (7).
3. Fill the hydraulic reservoir. Hydraulic oil must be 1 inch below opening. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-2](#).
4. Turn on the key switch (23, [Figure 12-16](#)) and emergency disconnect (20).
5. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
6. Check level of hydraulic oil. Hydraulic oil must be 1 inch below opening. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-2](#).
7. Install the compartment cover as described in paragraph [5-2](#).

SECTION 10 ELECTRICAL COMPONENTS

10-1.ELECTRICAL CONTROL PANEL

10-1.1.Maintenance

NOTE: Erratic operation of the truck may be caused by defective controller components. Before removing the electrical panel, perform troubleshooting procedures per [SECTION 4](#), to determine corrective action to be taken.

There are no user-serviceable parts inside the controller. No attempt should be made to open the controller. Opening the controller may damage it and will void the warranty.

The controller is programmed at the factory specifically for the truck model on which it is equipped. It is important to replace the controller with the correct pre-programmed unit to assure proper performance settings intended for that particular truck. See [Figure 12-16](#) for the preprogrammed controller number.

It is recommended that the controller exterior be cleaned periodically, and if a Zapi Handset is available, this periodic cleaning provides a good opportunity to check the controller's diagnostic history file. It is also recommended that the controller's fault detection circuitry be checked whenever the vehicle is serviced.

10-1.2. Cleaning

1. Turn off the key switch (23, [Figure 10-1](#)) and emergency disconnect (20).
2. Remove the upper compartment covers as described in paragraph [5-2](#).
3. Remove any dirt or corrosion from the bus bar area. The controller should be wiped clean with a moist rag. Allow it to dry before reconnecting the battery.
4. Make sure the connections to the buss bars are tight. Use two well insulated wrenches for this task in order to avoid steering the buss bars.

10-1.3. Controller Removal.

1. Turn off the key switch (23, [Figure 10-1](#)) and emergency disconnect (20).
2. Remove the upper compartment covers as described in paragraph [5-2](#).

3. Tag and disconnect harness (2, [Figure 10-2](#)) from controller (3, [Figure 10-1](#)).
4. Remove two screws (1) and two lock washers (2). Remove controller (3) and heat sink (4) from bracket (8).

10-1.4. Controller Installation.

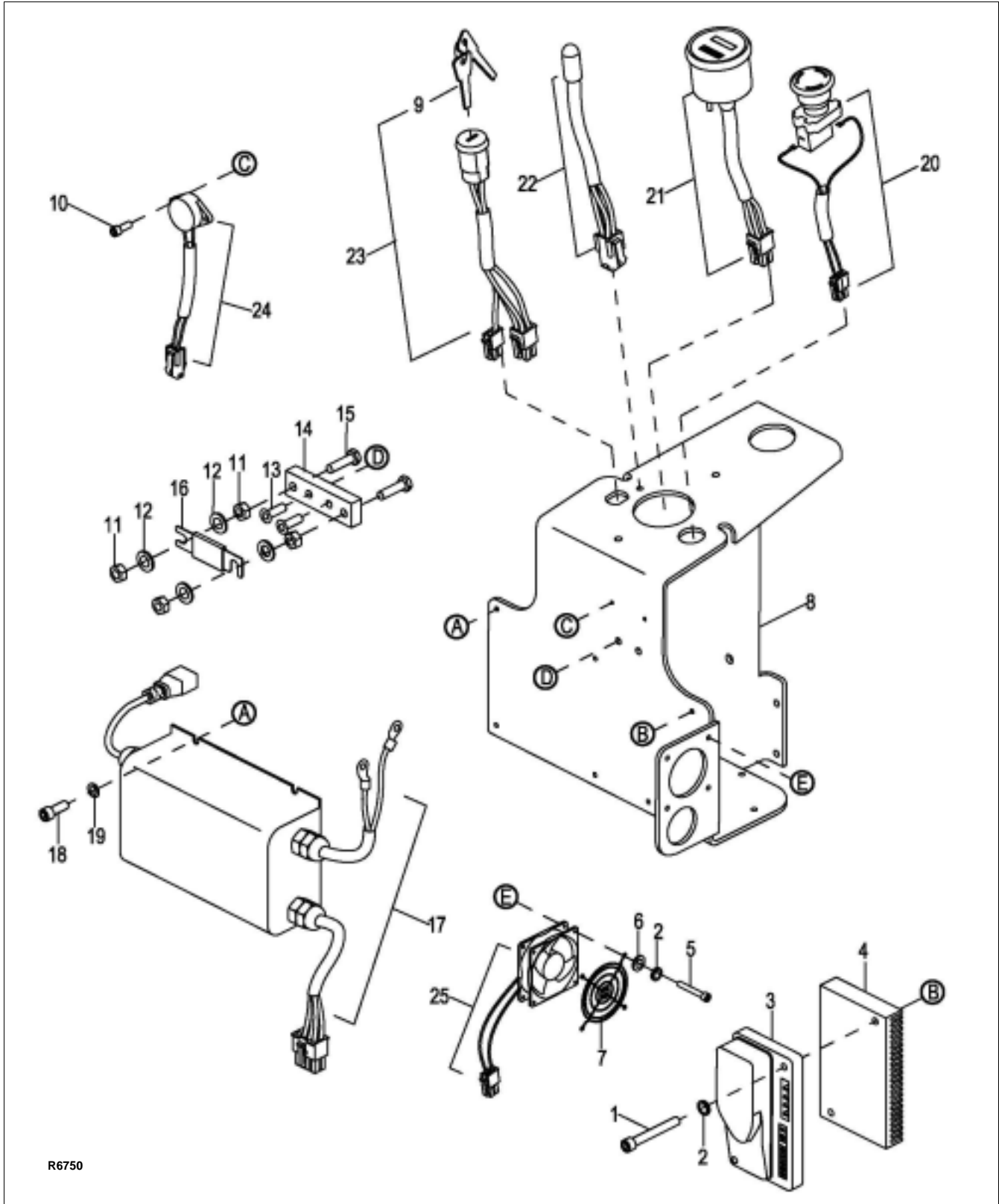
1. Position controller (3, [Figure 10-1](#)) and heat sink (4) on bracket (8) and secure with two screws (1) and two lock washers (2).
2. Reconnect harness (2, [Figure 10-2](#)) to controller (3, [Figure 10-1](#)).
3. Install upper compartment covers as described in paragraph [5-2](#).
4. Turn on the key switch (23) and emergency disconnect (20).

10-1.5. Charger Removal.

1. Turn off the key switch (23, [Figure 10-1](#)) and emergency disconnect (20).
2. Remove the upper compartment covers as described in paragraph [5-2](#).
3. Tag and disconnect harness (2, [Figure 10-2](#)) from charger (17, [Figure 10-1](#)).
4. Tag and disconnect remaining two charger leads from the pump motor and the fuse. Refer to [Figure 10-3](#).
5. Remove four screws (18) and four washers (19). Remove charger (17) from bracket (8).

10-1.6. Charger Installation.

1. Position charger (17, [Figure 10-1](#)) on bracket (8) and secure with four screws (18) and four washers (19).
2. Reconnect the two charger leads to the pump motor and the fuse. Refer to [Figure 10-3](#).
3. Reconnect harness (2, [Figure 10-2](#)) to charger (17, [Figure 10-1](#)).
4. Install upper compartment covers as described in paragraph [5-2](#).
5. Turn on the key switch (23) and emergency disconnect (20).



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Figure 10-1 Electrical System

10-1.7. Cooling Fan Removal.

1. Turn off the key switch (23, [Figure 10-1](#)) and emergency disconnect (20).
2. Remove the upper compartment covers as described in paragraph [5-2](#).
3. Tag and disconnect harness (2, [Figure 10-2](#)) from cooling fan (25, [Figure 10-1](#)).
4. Remove four screws (5), four lock washers (2) and four washers (6). Remove cooling fan (25) and guard (7) from bracket (8).

10-1.8. Cooling Fan Installation.

1. Position cooling fan (25, [Figure 10-1](#)) and guard (7) on bracket (8) and secure with four screws (5), four lock washers (2) and four washers (6).
2. Reconnect harness (2, [Figure 10-2](#)) to cooling fan (25, [Figure 10-1](#)).
3. Install upper compartment covers as described in paragraph [5-2](#).
4. Turn on the key switch (23) and emergency disconnect (20).

10-1.9. Buzzer Removal.

1. Turn off the key switch (23, [Figure 10-1](#)) and emergency disconnect (20).
2. Remove the upper compartment covers as described in paragraph [5-2](#).
3. Tag and disconnect harness (2, [Figure 10-2](#)) from buzzer (24, [Figure 10-1](#)).
4. Remove two screws (10) and buzzer (24) from bracket (8).

10-1.10. Buzzer Installation.

1. Position buzzer (24, [Figure 10-1](#)) on bracket (8) and secure with two screws (10).
2. Reconnect harness (2, [Figure 10-2](#)) to buzzer (24, [Figure 10-1](#)).
3. Install upper compartment covers as described in paragraph [5-2](#).
4. Turn on the key switch (23) and emergency disconnect (20).

10-1.11. Key Switch Removal.

1. Turn off the key switch (23, [Figure 10-1](#)) and emergency disconnect (20).
2. Remove the upper compartment covers as described in paragraph [5-2](#).

3. Tag and disconnect harness (2, [Figure 10-2](#)) from key switch (23, [Figure 10-1](#)).
4. Remove mounting nut and key switch (23) from bracket (8).

10-1.12. Key Switch Installation.

1. Position key switch (23, [Figure 10-1](#)) on bracket (8) and secure with its mounting nut.
2. Reconnect harness (2, [Figure 10-2](#)) to key switch (23, [Figure 10-1](#)).
3. Install upper compartment covers as described in paragraph [5-2](#).
4. Turn on the key switch (23) and emergency disconnect (20).

10-1.13. Battery Indicator Removal.

1. Turn off the key switch (23, [Figure 10-1](#)) and emergency disconnect (20).
2. Remove the upper compartment covers as described in paragraph [5-2](#).
3. Tag and disconnect harness (2, [Figure 10-2](#)) from battery indicator (21, [Figure 10-1](#)).
4. Remove mounting nuts and bracket and remove battery indicator (21) from bracket (8).

10-1.14. Battery Indicator Installation.

1. Position battery indicator (21, [Figure 10-1](#)) on bracket (8) and secure with its mounting bracket and nuts.
2. Reconnect harness (2, [Figure 10-2](#)) to battery indicator (21, [Figure 10-1](#)).
3. Install upper compartment covers as described in paragraph [5-2](#).
4. Turn on the key switch (23) and emergency disconnect (20).

10-1.15. Emergency Disconnect Removal.

1. Turn off the key switch (23, [Figure 10-1](#)) and emergency disconnect (20).
2. Remove the upper compartment covers as described in paragraph [5-2](#).
3. Tag and disconnect harness (2, [Figure 10-2](#)) from emergency disconnect (20, [Figure 10-1](#)).
4. Remove the knob from the emergency disconnect (20)
5. Remove mounting nut and remove emergency disconnect (20) from bracket (8).

10-1.16. Emergency Disconnect Installation.

1. Position emergency disconnect (20, [Figure 10-1](#)) on bracket (8) and secure with its mounting nut.
2. Install the knob on the emergency disconnect (20)
3. Reconnect harness (2, [Figure 10-2](#)) to emergency disconnect (20, [Figure 10-1](#)).
4. Install upper compartment covers as described in paragraph 5-2.
5. Turn on the key switch (23) and emergency disconnect (20).

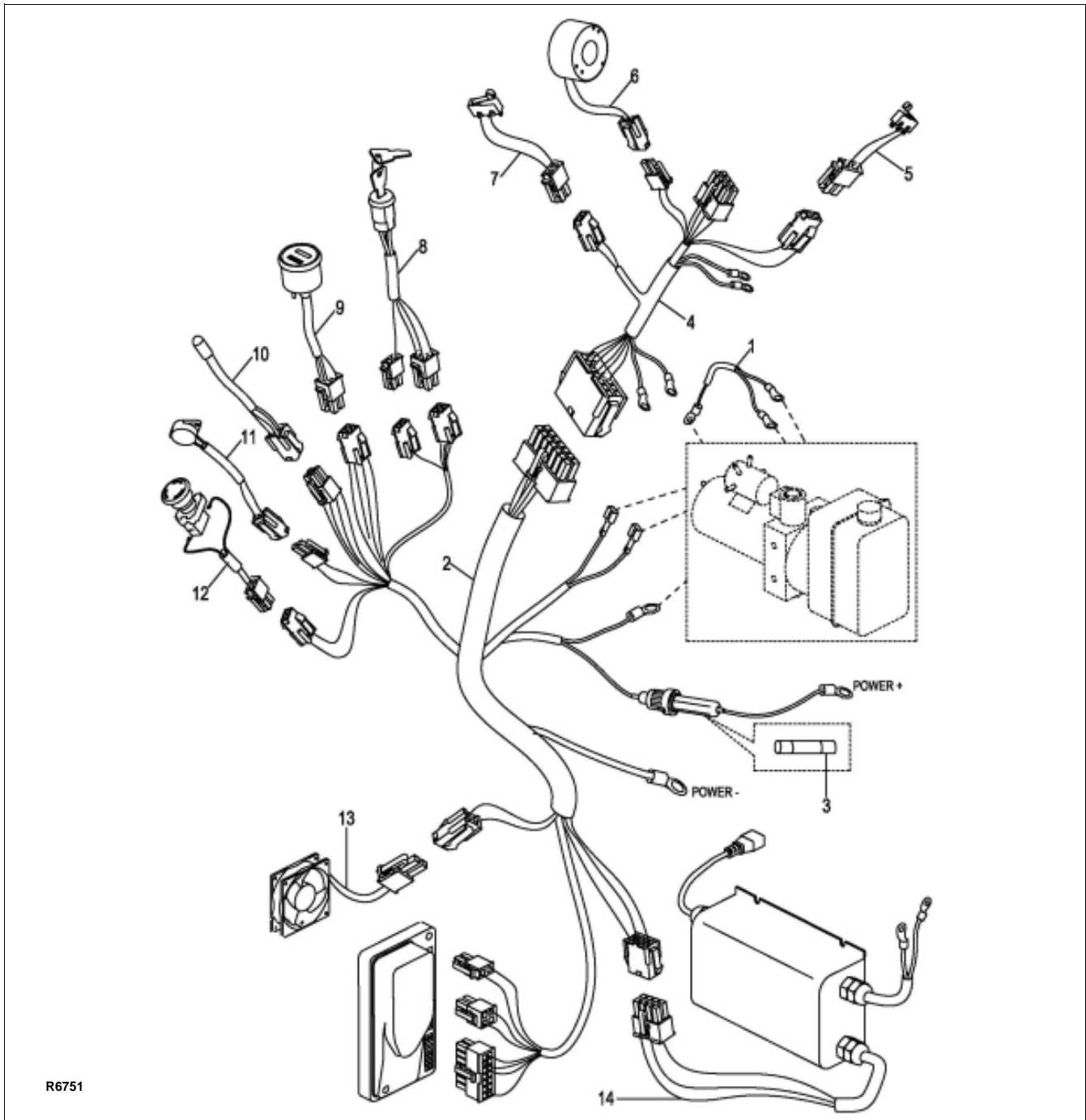
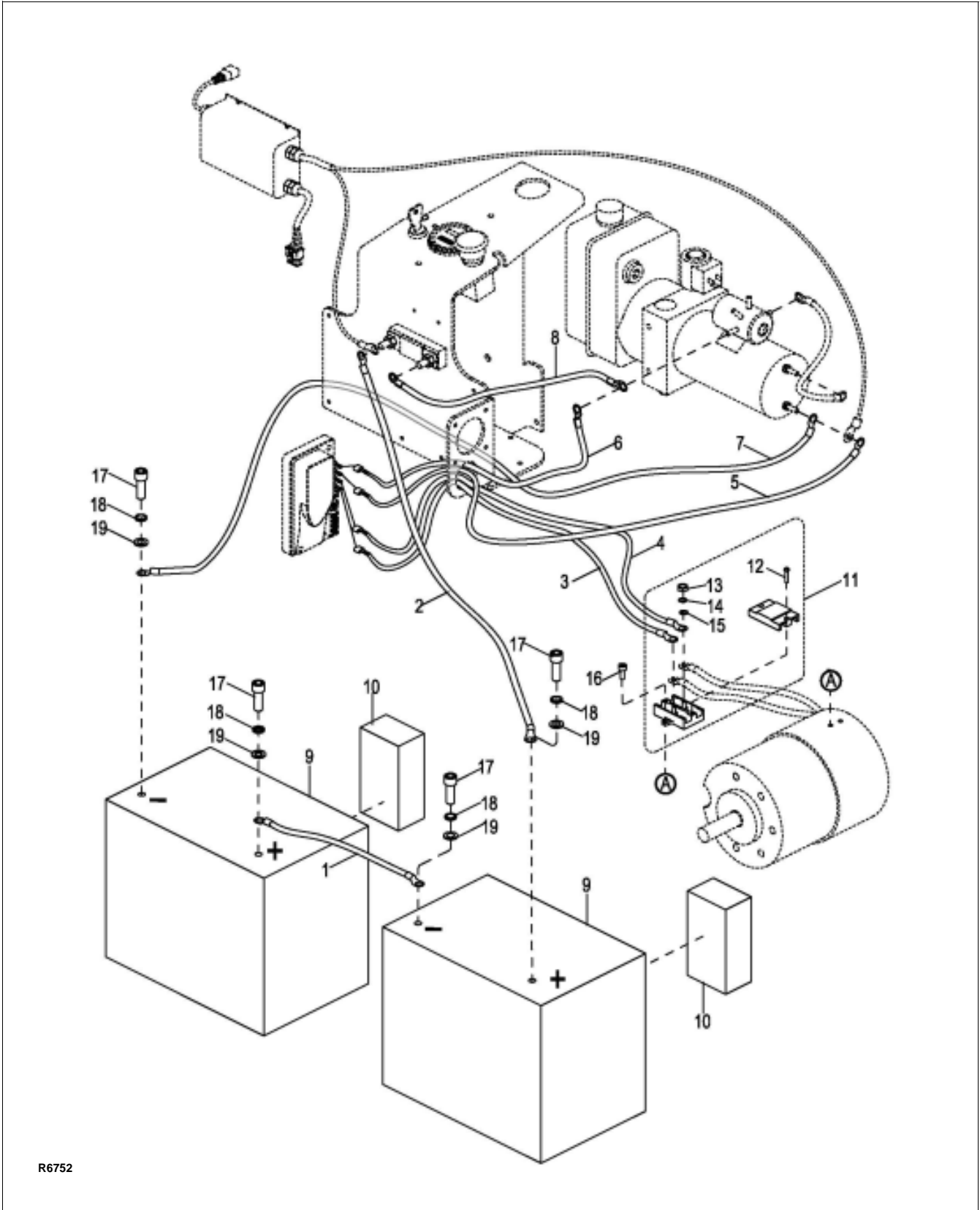


Figure 10-2 Wiring Harness



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Figure 10-3 Wiring Cables

10-1.17.Lift Limit Switch Removal.

1. Lower forks fully.
2. Turn off the key switch (23, Figure 10-1) and emergency disconnect (20).
3. Remove the upper compartment covers as described in paragraph 5-2.
4. Tag and disconnect harness (4, Figure 10-2) from limit switch (10, Figure 12-9).
5. Remove two screws (1) and limit switch (10) from bracket (2).

10-1.18.Lift Limit Switch Installation.

1. Position limit switch (10, Figure 12-9) on bracket (2) and secure with two screws (1).
2. Reconnect harness (4, Figure 10-2) to limit switch (10, Figure 12-9).
3. Install upper compartment covers as described in paragraph 5-2.
4. Turn on the key switch (23) and emergency disconnect (20).

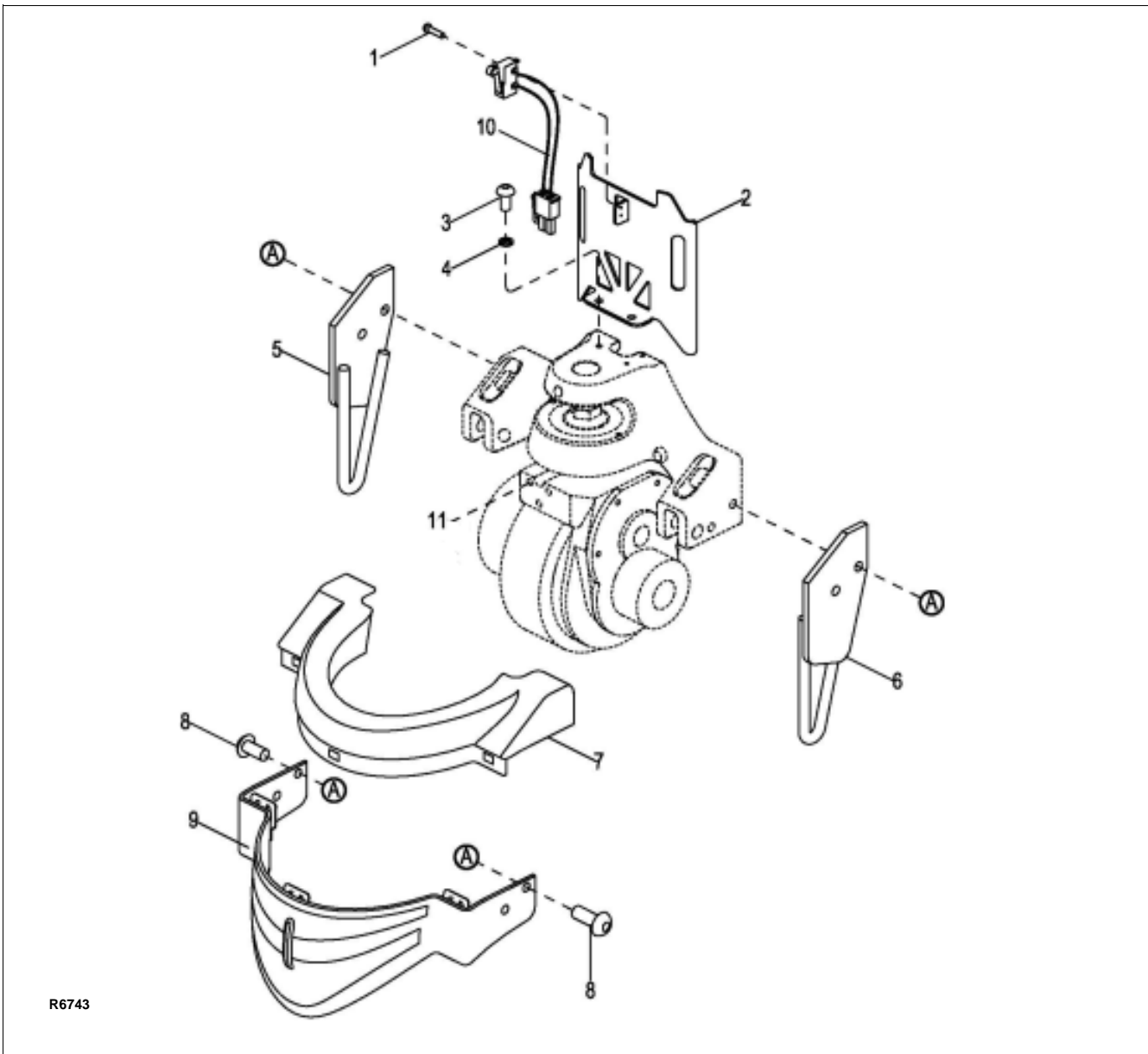


Figure 10-4 Compartment

10-2.PUMP MOTOR.

The pump motor is replaceable but not repairable. Refer to paragraph 9-3.

10-3.DRIVE MOTOR.

The drive motor exposed surfaces should be cleaned at least once a month to assure proper cooling of motor. Use an air hose to blow dust off of motor surfaces.

The drive motor is replaceable but not repairable. Refer to paragraph 7-1.

10-4.DEADMAN SWITCH

10-4.1.Replacement

1. Turn off the key switch (23, [Figure 10-1](#)) and emergency disconnect (20).

2. Remove the upper compartment covers as described in paragraph [5-2](#).
1. Disconnect wiring from the deadman switch (16, [Figure 12-1](#)).
2. Remove the two screws (3), and bracket (11) from bracket (5).
3. Remove two screws (12) and switch (16) from bracket (11).
4. Position the new switch (16) on bracket (11) and secure with the two screws (12).
5. Position bracket (11) on bracket (5) and secure with two screws (3).
6. Install upper compartment covers as described in paragraph [5-2](#).
7. Turn on the key switch (23) and emergency disconnect (20).

NOTES

**SECTION 11
OPTIONAL EQUIPMENT**

NOTES

SECTION 12
ILLUSTRATED PARTS BREAKDOWN

Following is an illustrated parts breakdown of assemblies and parts associated with the E30 Lift Truck.

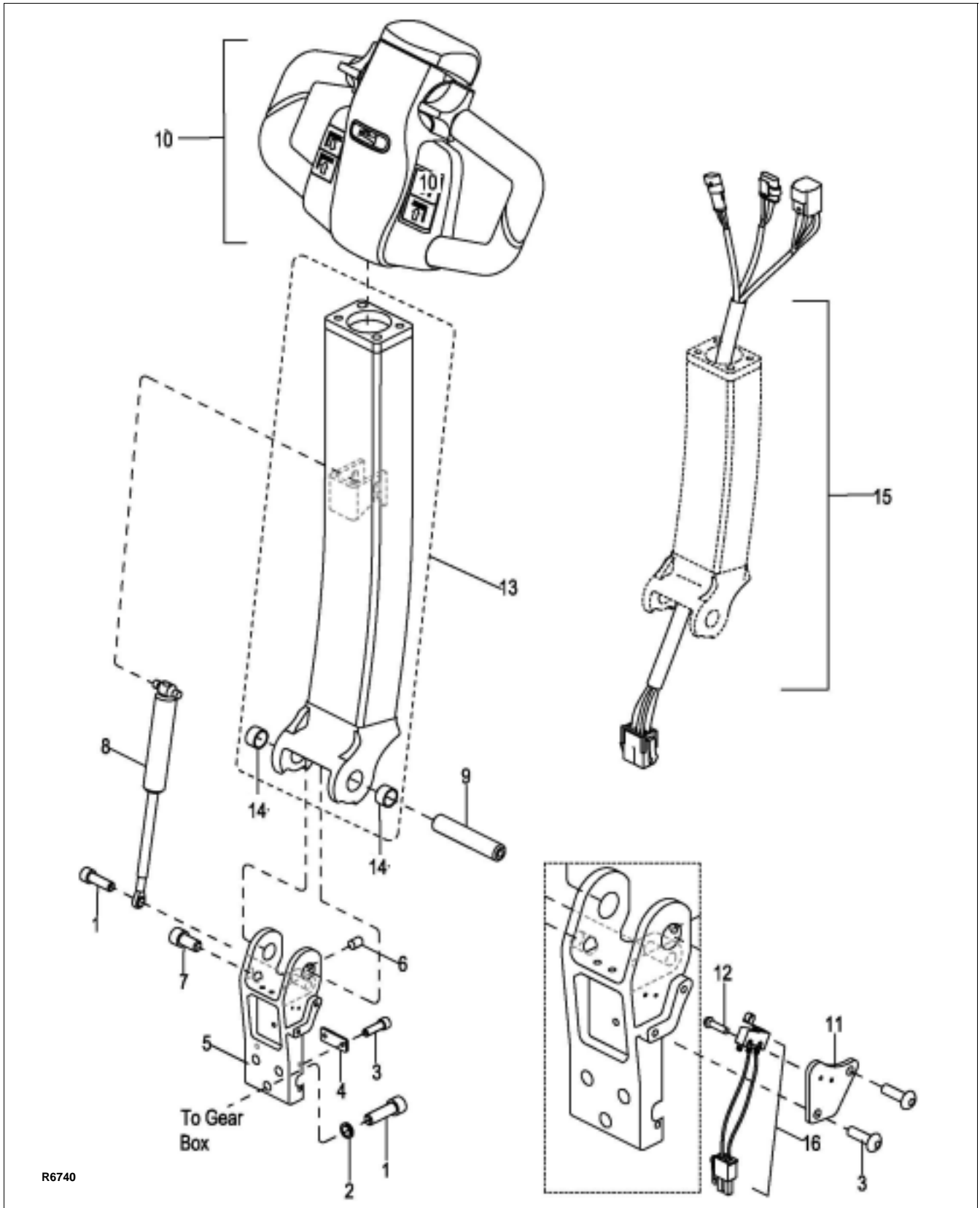
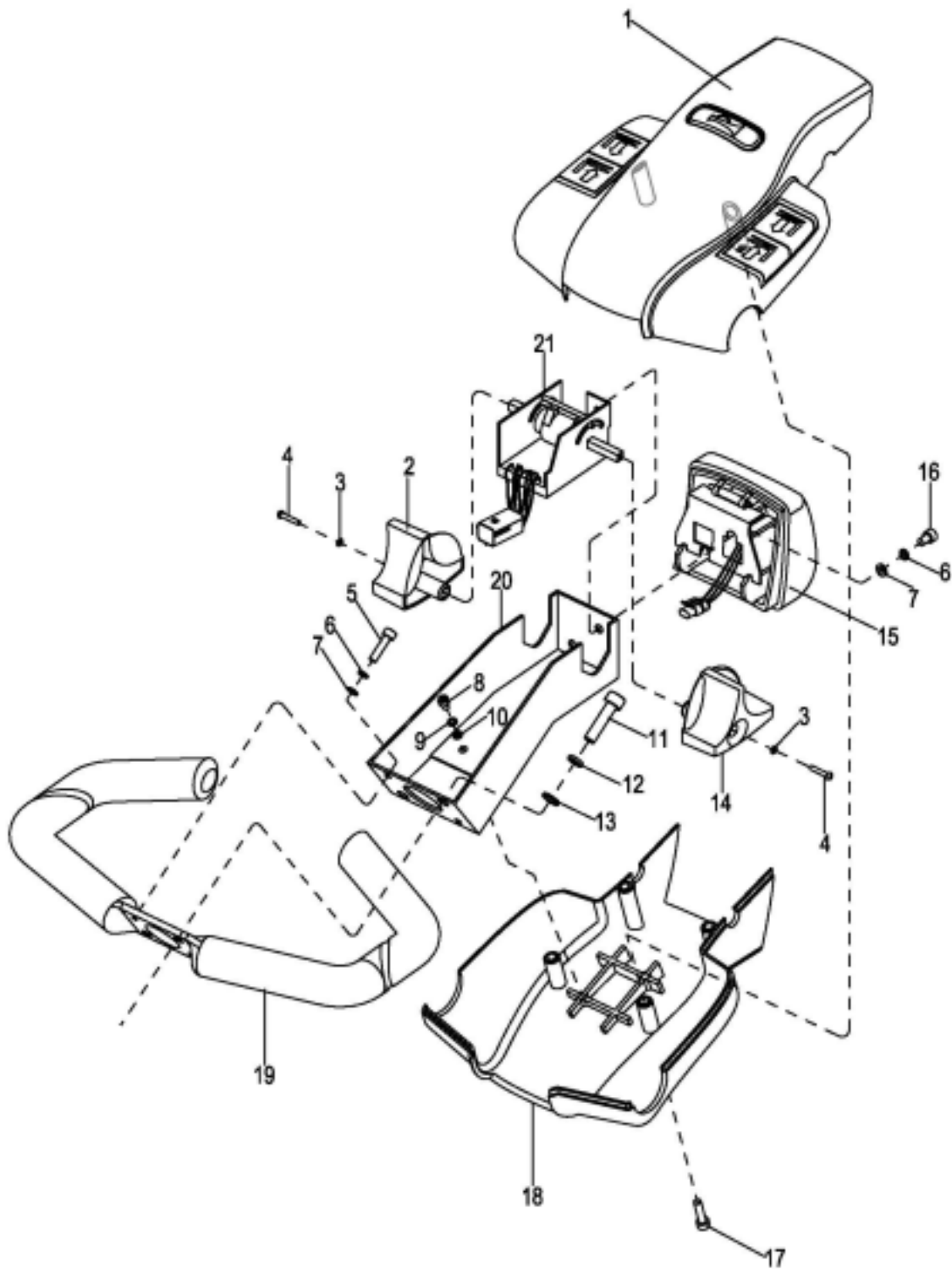


Figure 12-1 Steering Arm

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	0000-000322-00	SCREW, M8 X 25	4
2	0000-000159-00	WASHER, LOCK, M8	3
3	0000-000654-00	SCREW, M4 X 8	4
4	1115-500004-00	PLATE	1
5	1115-300001-00	BRACKET	1
6	0000-000016-00	SCREW, M6 X 8	1
7	0000-000030-00	SCREW, M10 X 16	1
8	1120-300000-00	GAS SPRING	1
9	1115-300002-00	SHAFT	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
10	—	CONTROL HEAD (FIGURE 12-2)	REF
11	1115-500001-00	BRACKET	1
12	0000-000120-00	SCREW, M2 X 8	2
13	1115-310000-00	CONTROL ARM	1
14	0000-000677-00	BUSHING, 1610	2
15	1115-520010-00	WIRE HARNESS	1
16	1115-520009-00	SWITCH ASSY, DEADMAN	1



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Figure 12-2 Control Head

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	1120-340000-00	CONTROL HEAD	1
1	—	• CAP ASSEMBLY (FIGURE 12-3)	REF
2	1120-3400005-00	• CONTROL KNOB	1
3	0000-000038-00	• WASHER, LOCK, M3	2
4	0000-000037-00	• SCREW, M3 X 15	2
5	0000-000004-00	• SCREW, M5 X 12	2
6	0000-000206-00	• WASHER, LOCK, M5	4
7	0000-000002-00	• WASHER, FLAT, M5	4
8	0000-000088-00	• SCREW, M4 X 8	2
9	0000-000122-00	• WASHER, LOCK, M4	2
10	0000-000005-00	• WASHER, FLAT, M4	2
11	0000-000322-00	• SCREW, M8 X 25	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
12	0000-000159-00	• WASHER, LOCK, M8	2
13	0000-000176-00	• WASHER, FLAT	2
14	1120-340003-00	• CONTROL KNOB	1
15	—	• EMERGENCY REVERSE SWITCH ASSY (FIGURE 12-7)	REF
16	0000-000010-00	• SCREW, M5 X 6	2
17	0000-000035-00	• SCREW, M5 X 20	4
18	1120-340002-00	• COVER	1
19	1120-341000-00	• HANDLE	1
20	1120-340001-00	• CONNECTOR BRACKET	1
21	1115-520008-00	• PPOTENTIOMETER ASSY	1

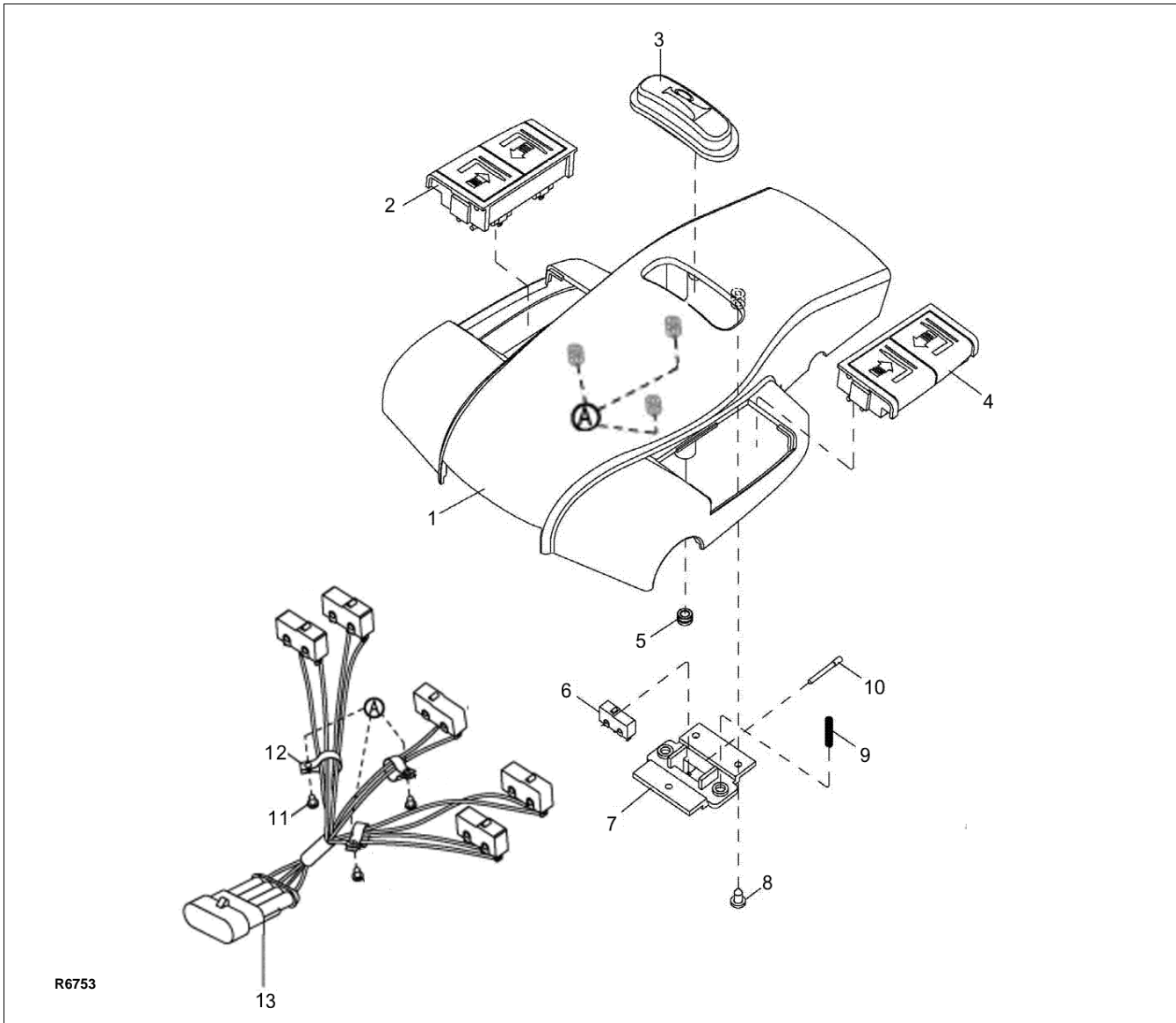


Figure 12-3 Cap Assembly

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	1120-342000-00	CAP ASSEMBLY	1
1	1120-342001-00	• COVER	1
2	—	• LIFT/LOWERING SWITCH ASSY, RIGHT (FIGURE 12-6)	REF
3	1120-342002-00	• HORN BUTTON	1
4	—	• LIFT/LOWERING SWITCH ASSY, LEFT (FIGURE 12-4)	REF
5	0000-000040-00	• NUT	4

INDEX NO.	PART NO.	PART NAME	NO. REQD.
6	1120-310001-00	• HORN SWITCH	1
7	1120-342004-00	• HORN SWITCH BRACKET	1
8	0000-000039-00	• SCREW	3
9	1120-342003-00	• SPRING	2
10	1120-342005-00	• PIN	2
11	0000-000039-00	• SCREW, ST3.5 X 9.5	3
12	0000-000490-00	• CLAMP	3
13	1120-520006-0C	• HARNESS ASSY SWITCH	1

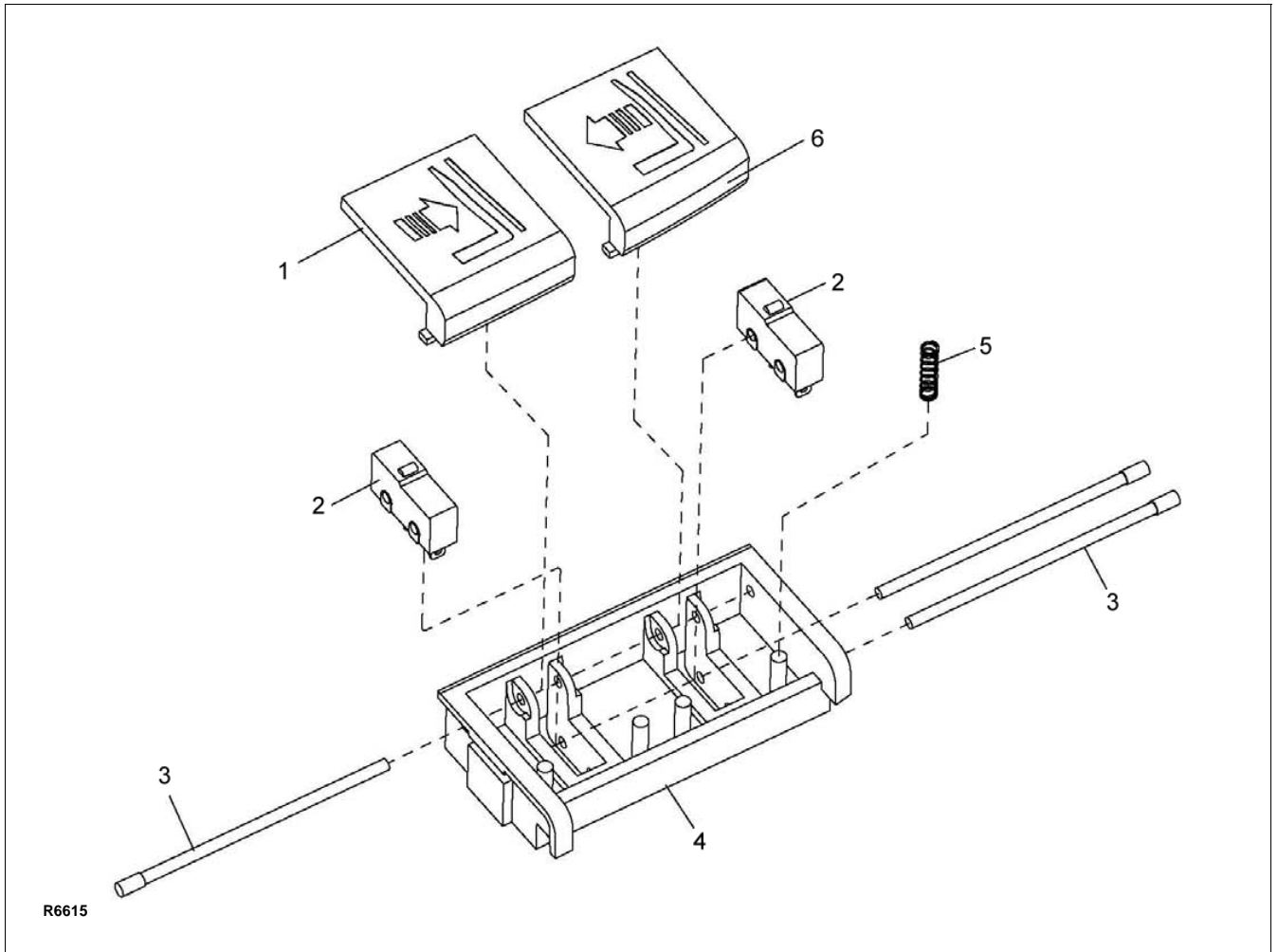


Figure 12-4 Lift/Lowering Switch Assy, Left

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	1120-342100-00	LIFT/LOWERING SWITCH ASSY, LEFT	1
1	1120-342103-00	• BUTTON, LOWERING	1
2	1120-310001-00	• SWITCH	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
3	1120342105-00	• PIN	3
4	1120-342101-00	• BUTTON BRACKET, LEFT	1
5	1120-342102-00	• SPRING	4
6	1120-342104-00	• BUTTON, LIFT	1

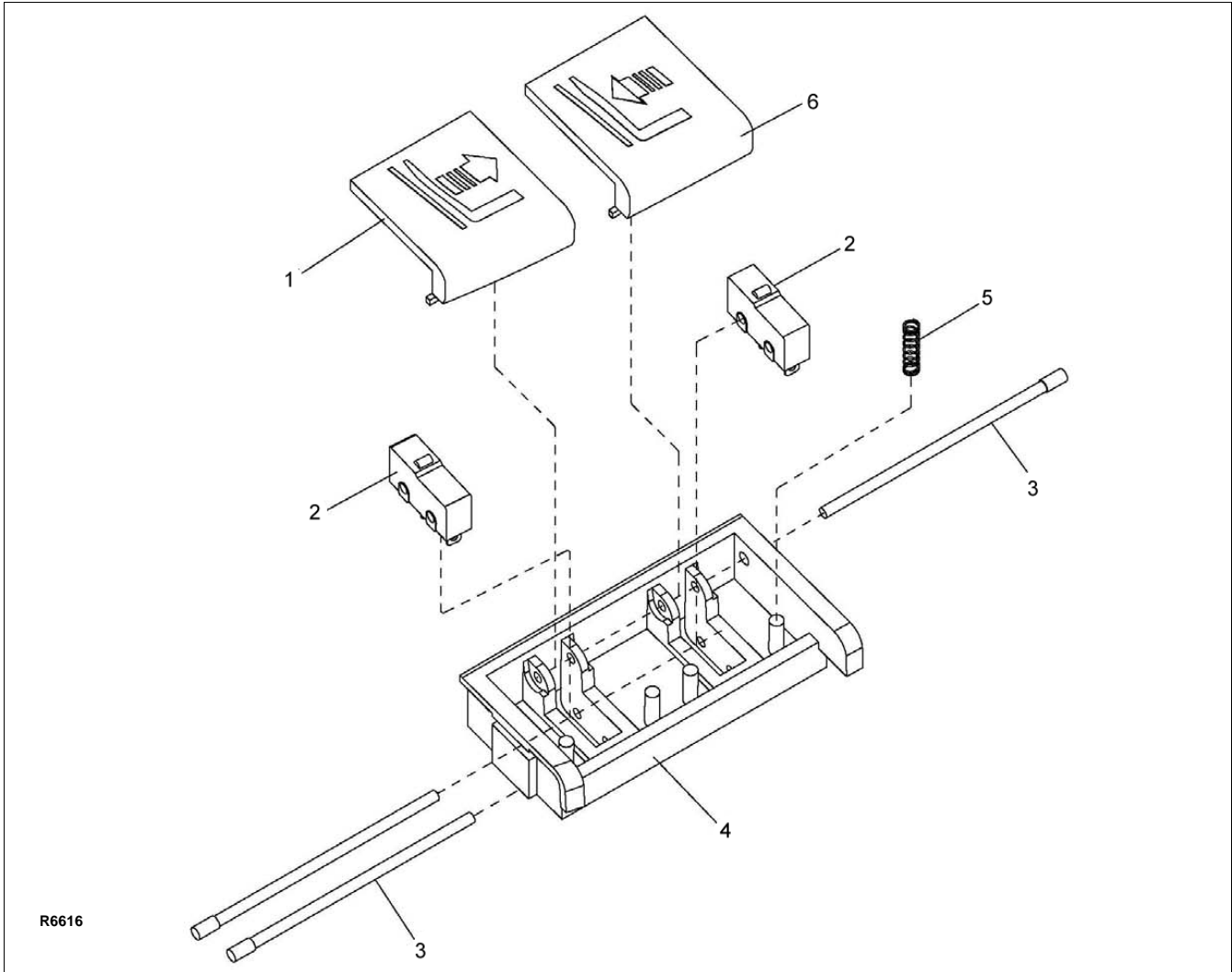


Figure 12-5 Lift/Lowering Switch Assy, Right

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	1120-342200-00	LIFT/LOWERING SWITCH ASSY, RIGHT	1
1	1120-342203-00	• BUTTON, LOWERING	1
2	1120-310001-00	• SWITCH	2
3	1120342105-00	• PIN	3

INDEX NO.	PART NO.	PART NAME	NO. REQD.
4	1120-342201-00	• BUTTON BRACKET, RIGHT	1
5	1120-342102-00	• SPRING	4
6	1120-342202-00	• BUTTON, LOWERINHG	1

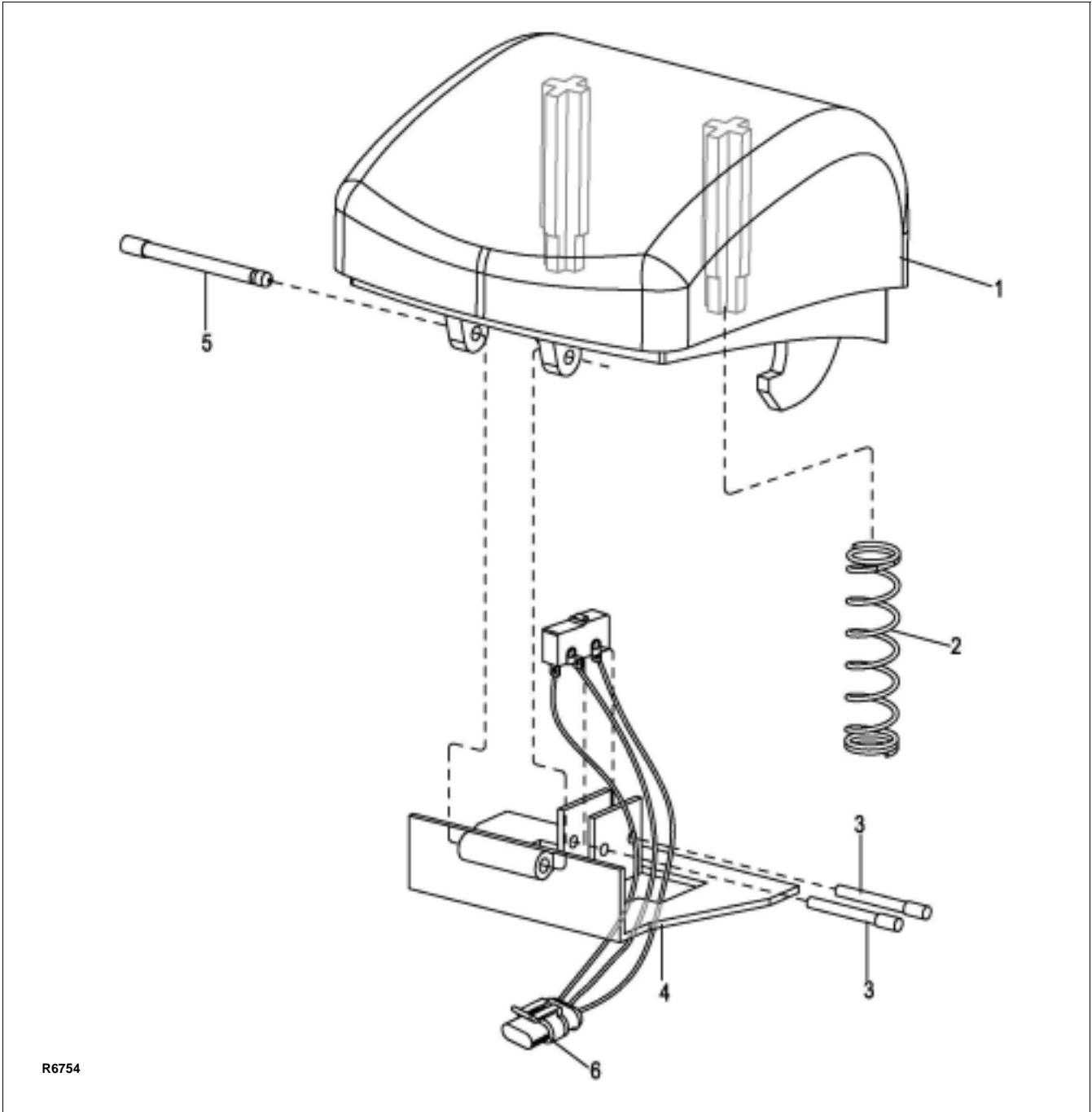
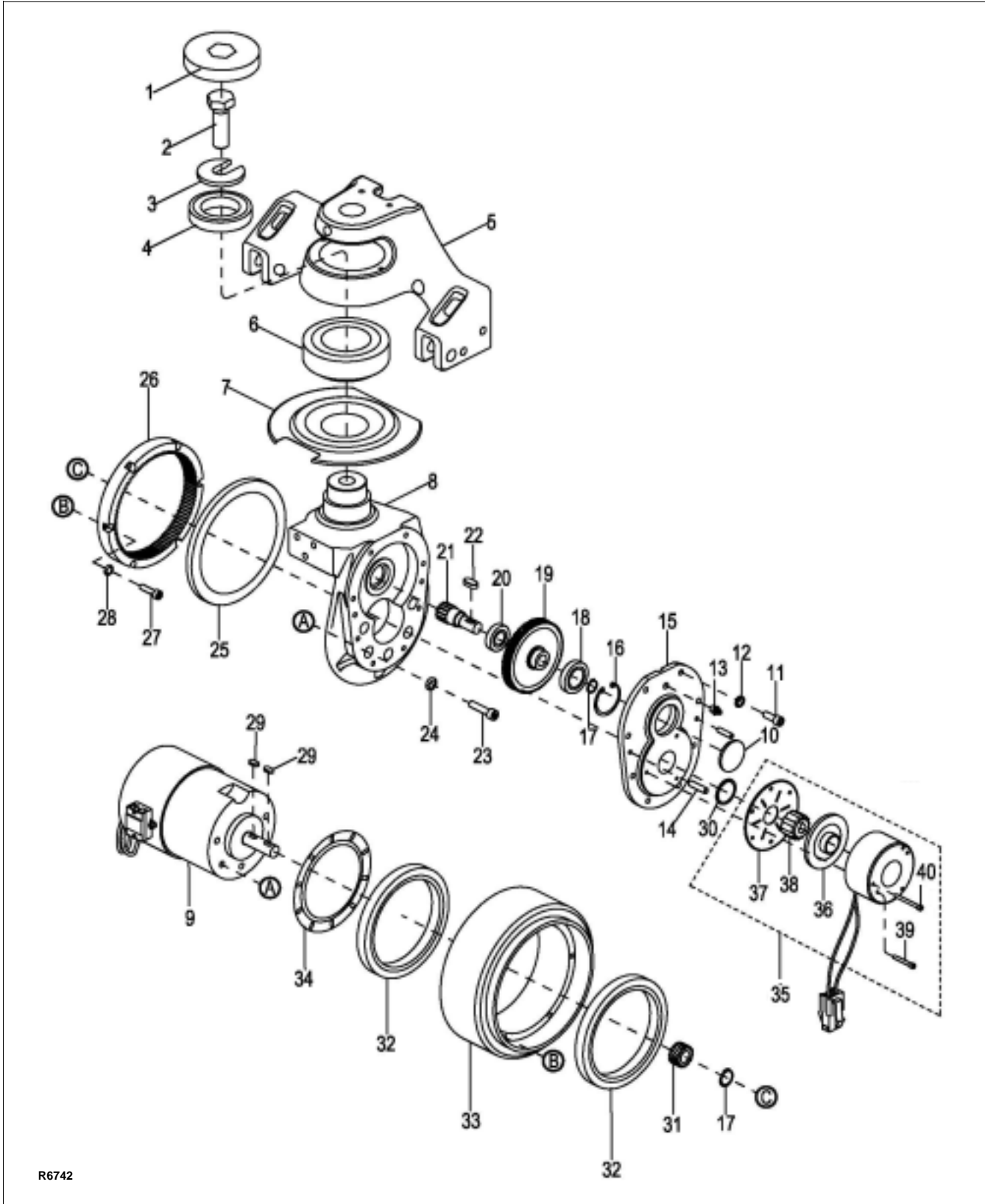


Figure 12-6 Transmission, Motor, Brake Assembly

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	1120-343000-00	EMERGENCY REVERSE SWITCH ASSY	1
1	1120-343002-00	• EMERGENCY REVERSE BUTTON	1
2	1120-343003-00	• SPRING	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
3	1120342005.00	• PIN	2
4	1120-343001-0A	• BRACKET	1
5	1120-343004-00	• PIN	1
6	1115-520004-00	• SWITCH ASSY	1



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Figure 12-7 Transmission Motor, Brake Mounting

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	1115-200012-00	WASHER, RUBBER	1
2	1115-200011-00	BOLT, M20 X 1.5 X 60	1
3	1115-200009-0A	PLATE	1
4	0000-000657-00	BEARING, 6010-Z	1
5	1115-200008-0A	MOUNTING FRAME	1
6	0000-000668-00	BEARING, 30212	1
7	1115-200006-0A	COVER PLATE	1
8	1115-210001-0A	GEAR BOX HOUSING	1
9	1115-230000-00	MOTOR	1
10	1115-200007-00	CAP	1
11	0000-000386-00	SCREW, M6 X 20	8
12	0000-000056-00	WASHER, LOCK, M6	8
13	0000-000013-00	GREASE FITTING, M8	1
14	0000-000669-00	PIN, M6 X 24	2
15	1115-200001-00	COVER	1
16	0000-000658-00	CLIP, M42	1
17	0000-000659-00	CLIP, M15	2
18	0000-000667-00	BEARING, 61905	1
19	1115-200004-00	GEAR	1
20	0000-000680-00	BEARING, 16003	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
21	1115-200003-00	GEAR	1
22	0000-000660-00	KEY, 5 X 5 X 18	1
23	0000-000154-00	SCREW, M8 X 35	5
24	0000-000159-00	WASHER, LOCK, M8	5
25	0000-000670-00	OIL SEAL, 152 X 172 X 10	1
26	1115-200002-00	GEAR	1
27	0000-000661-00	SCREW, M5 X 20	6
28	0000-000206-00	WASHER, LOCK, M5	6
29	0000-000662-00	KEY, 5 X 5 X 12	2
30	0000-000671-00	OIL SEAL, 16 X 28 X 7	1
31	1115-200005-00	GEAR	1
32	0000-000663-00	BEARING, 61824	2
33	1115-220000-00	DRIVE WHEEL	1
34	1115-200010-00	RETAINER	1
35	1115-520012-00	BRAKE ASSEMBLY	1
36	1115-240001-00	• ROTOR	1
37	1115-240003-00	• FRICTION PLATE	1
38	1115-340002-00	• PINION	1
39	0000-000664-00	• SCREW, M4 X 40	2
40	0000-000665-00	• SCREW, M4 X 45	3

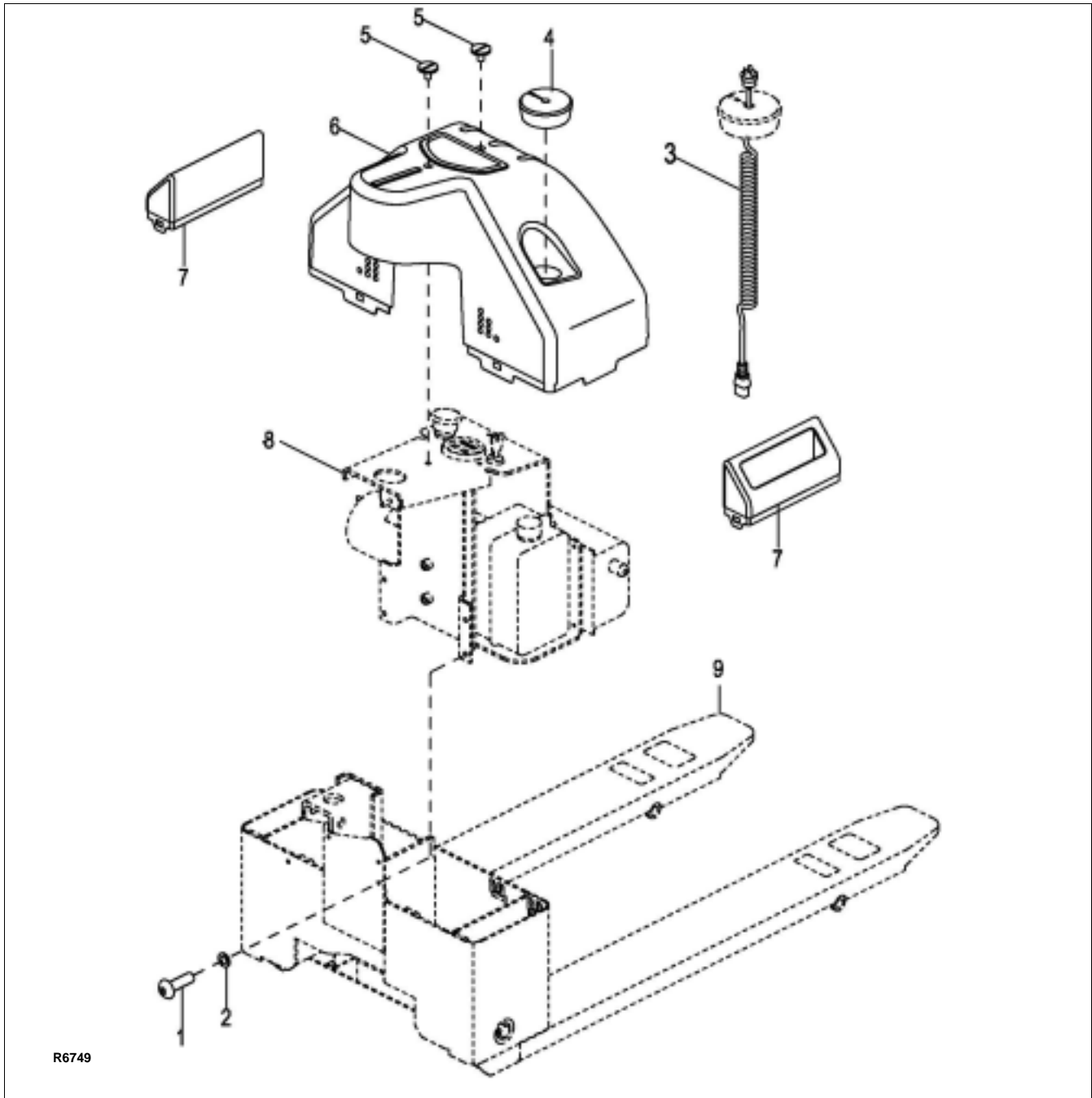
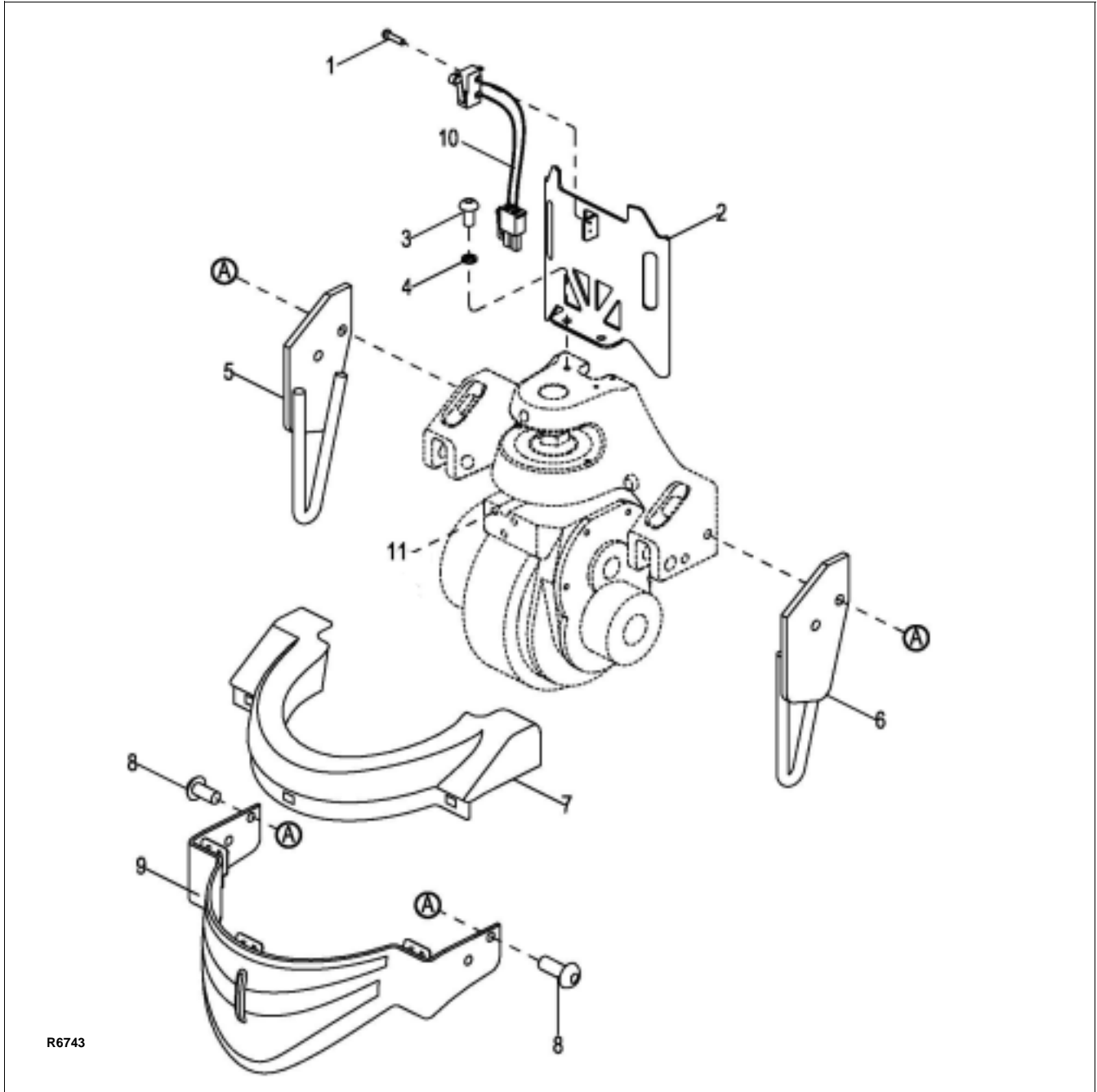


Figure 12-8 Compartment Cover

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	0000-000371-00	SCREW, M6 X 16	4
2	0000-000123-00	WASHER, FLAT, M6	4
3	1115-500006-10	CABLE CHARGER	1
4	1115-120002-00	CAP	1
5	1120-150004-00	SCREW, M6 X 25	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
6	1115-120001-00	COVER	1
7	1115-120003-00	COVER	2
8	—	HYDRAULIC SYSTEM (FIGURE 12-13)	REF
9	—	FRAME (FIGURE 12-10)	REF



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Figure 12-9 Compartment

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	0000-000120-00	SCREW, M2 X 8	2
2	1115-540000-00	BRACKET	1
3	0000-000179-00	SCREW, M6 X 10	2
4	0000-000123-00	WASHER, FLAT, M6	2
5	1115-140000-00	SKID, LEFT	1
6	1115-150000-00	SKID, RIGHT	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
7	1115-121000-00	COVER	1
8	0000-000655-00	SCREW, M10 X 25	4
9	1115-121100-00	COVER	1
10	1115-520006-00	LIMIT SWITCH ASSEMBLY	1
11	—	TRANSMISSION (FIGURE 12-7)	REF

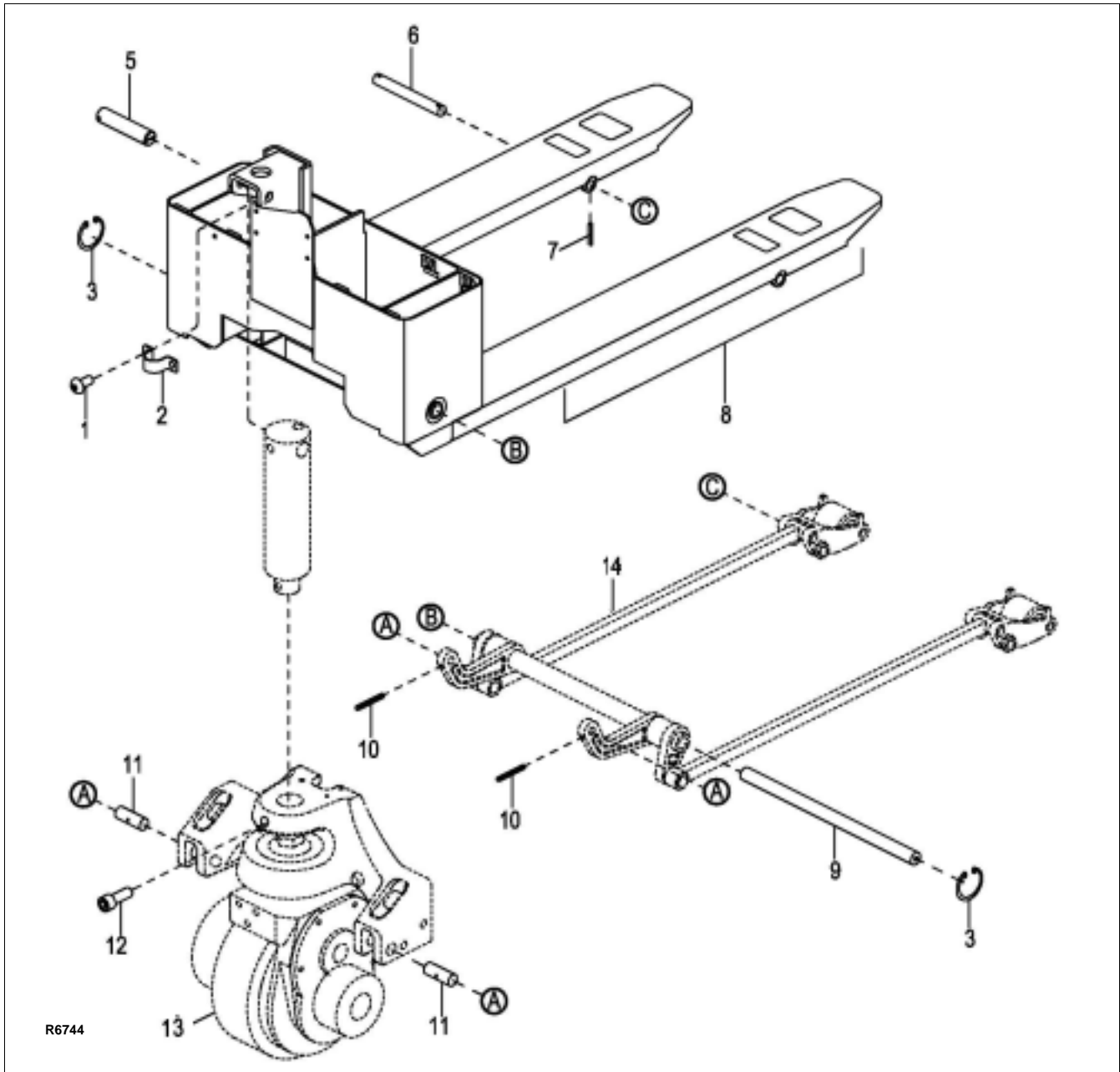


Figure 12-10 Frame

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	0000-000651-00	SCREW, M4 X 8	2
2	1115-500002-00	CLAMP	1
3	0000-000650-00	CLIP, M25	2
4	0000-000016-00	SCREW, M6 X 8	2
5	1115-400001-00	SHAFT	1
6	1115-130004-0A	SHAFT	2
7	0000-000652-00	PIN, M5 X 30	4
8	1115-110000-40	FRAME	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
9	1115-130002-0A	SHAFT	1
10	0000-000654-00	PIN, M4 X 45	2
11	1115-130001-00	SHAFT	2
12	0000-000032-00	SCREW, M6 X 25	1
13	—	TRANSMISSION (FIGURE 12-7)	REF
14	—	LIFT LINK ASSEMBLY (FIGURE 12-11)	REF

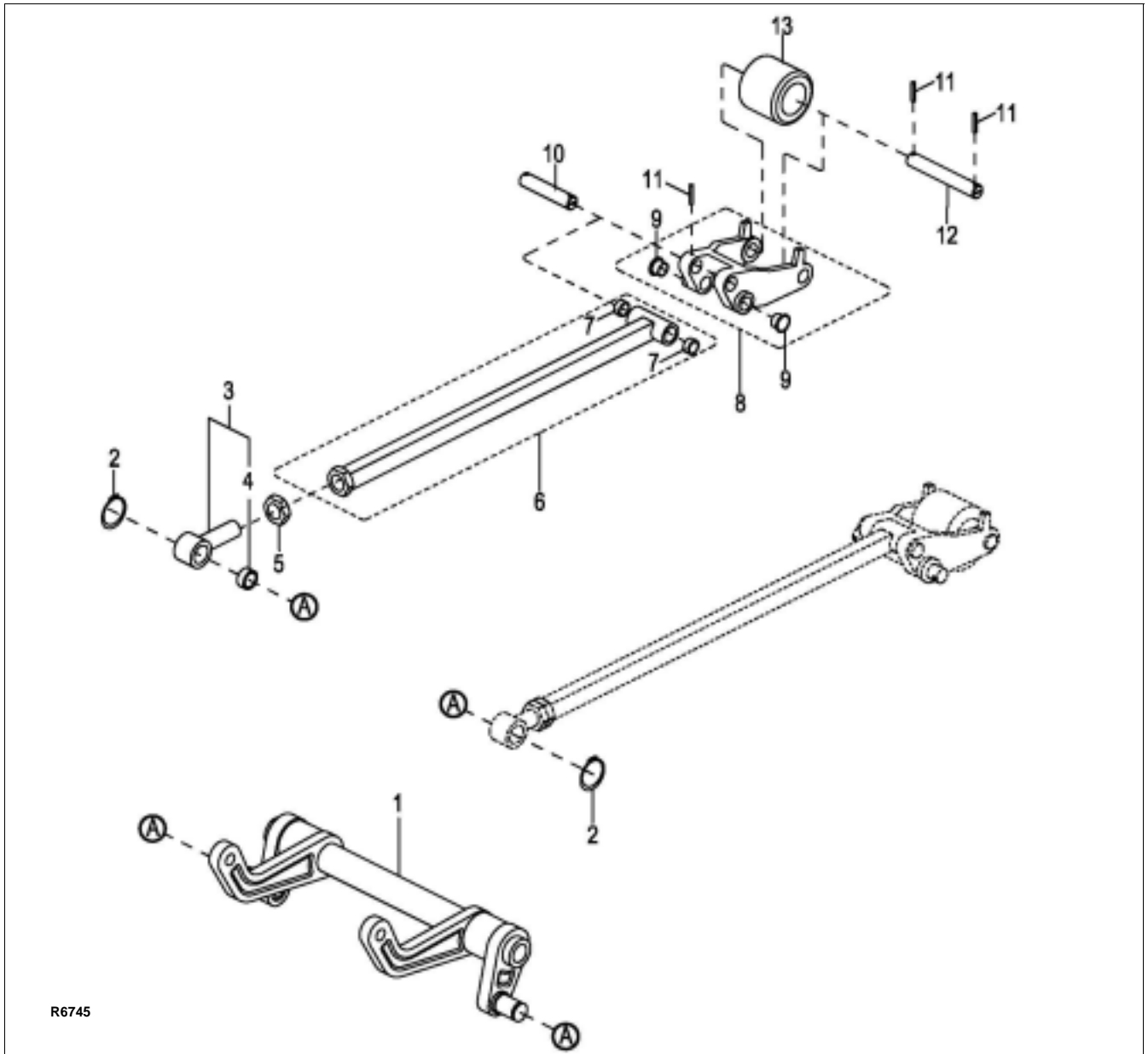


Figure 12-11 Lift Link Assembly

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	1115-131000-10	LOWER LINK	1
2	0000-000294-00	CLIP, M25	2
3	1115-132200-00	CLEVIS	2
4	0000-000675-00	• BUSHING, 2525	2
5	0000-000101-00	NUT, M22 X 1.5	2
6	1115-132100-00	TENSION BAR	2
7	0000-000011-00	• BUSHING, 2015	4

INDEX NO.	PART NO.	PART NAME	NO. REQD.
8	1115-130005-40	WHEEL BRACKET ASSY	2
9	0000-000029-00	• BUSHING, 2012	4
10	1115-130003-00	SHAFT	2
11	0000-000652-00	PIN, M5 X 30	4
12	1115-130007-40	SHAFT	1
13	—	LOAD WHEEL (FIGURE 12-13)	1

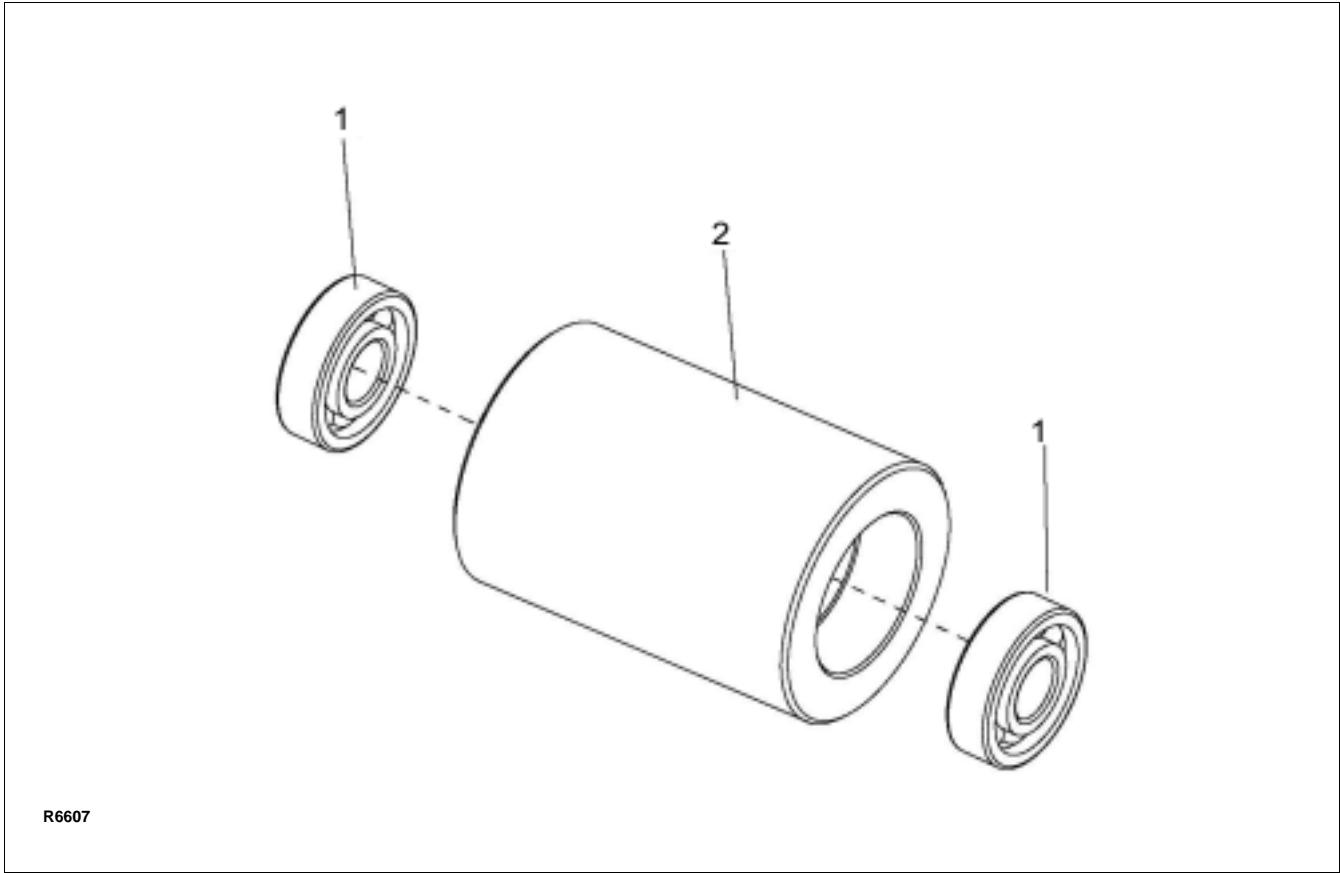
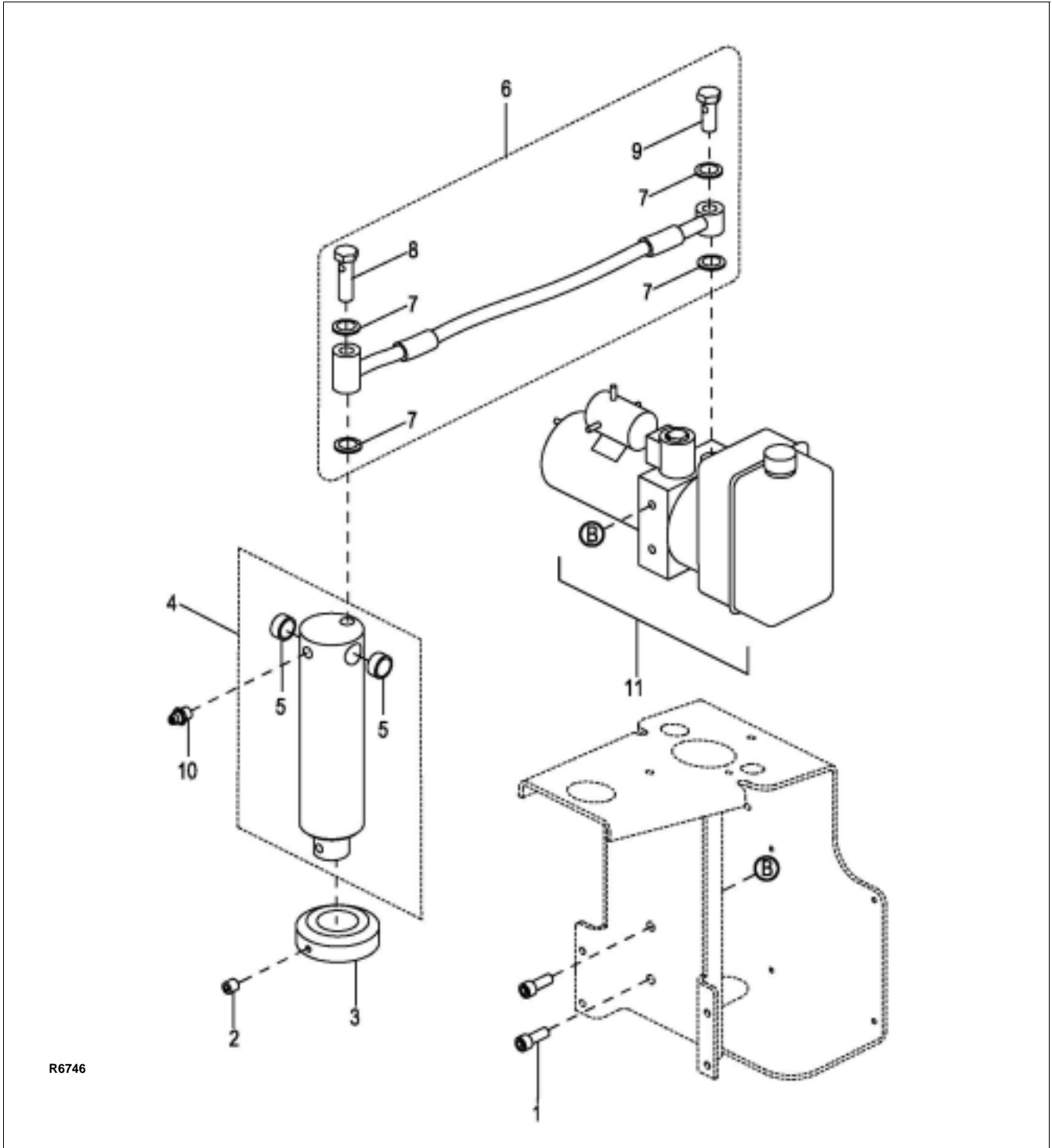


Figure 12-12 Load Wheel

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	1120-13300-40	LOAD WHEEL	2
1	0000-000020-00	• BEARING	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
2	1115-133002-40	• LOAD WHEEL	1

NOTES

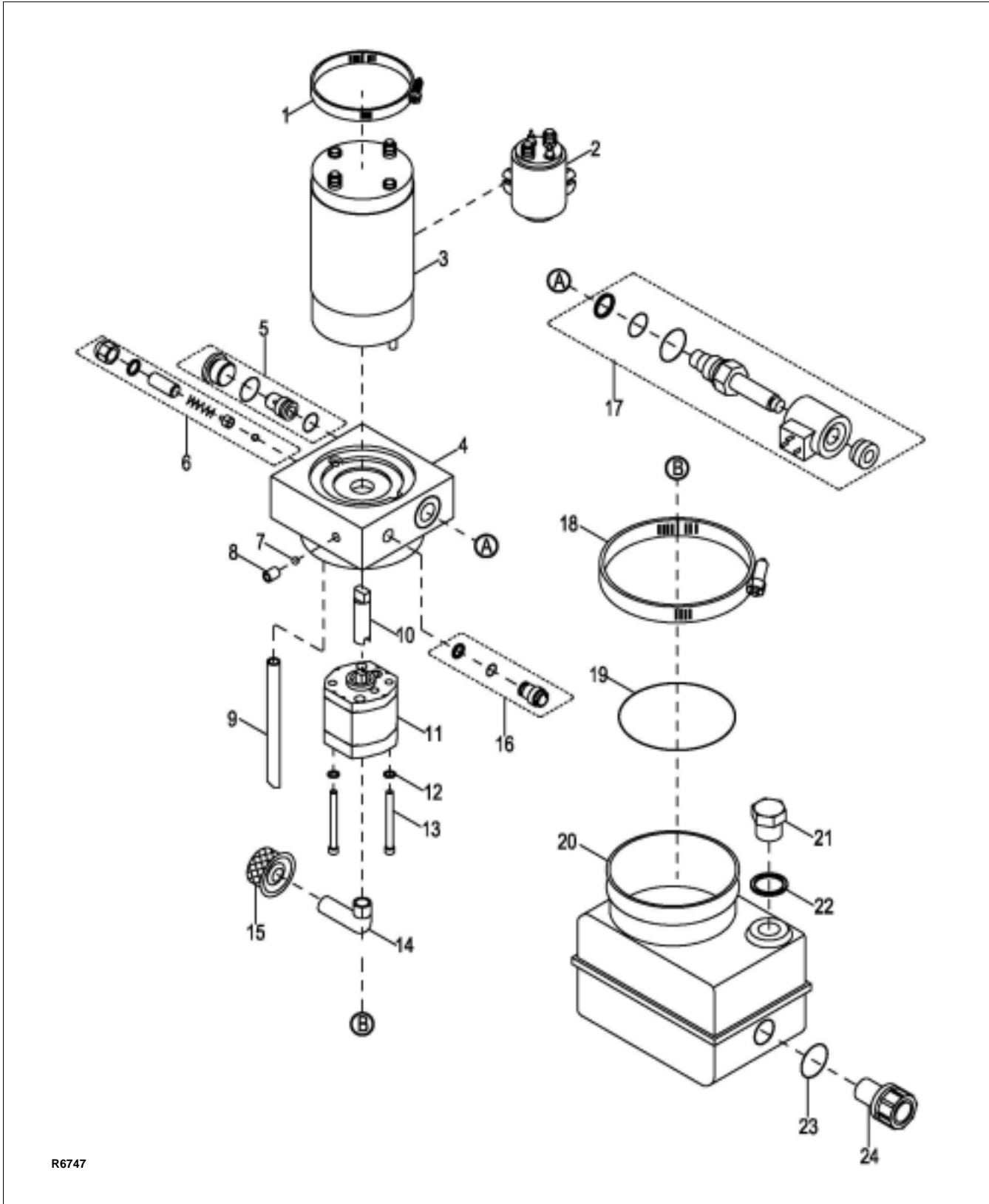


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Figure 12-13 Outer Mast

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	0000-000109-00	SCREW, M8 X 16	2
2	0000-000016-00	SCREW, M6 X 8	1
3	1115-400050-00	BLOCK	1
4	—	CYLINDER (FIGURE 12-15)	REF
5	0000-000011-00	• BUSHING, 2015	2
6	1150-420000-00	HOSE ASSY	1

INDEX NO.	PART NO.	PART NAME	NO. REQD.
7	0000-000044-00	• WASHER, M14	4
8	2401-146000-00	• BOLT	1
9	2401-143500-00	BOLT	1
10	0000-000013-00	GREASE FITTING, M8	1
11	—	PUMP & MOTOR ASSY (FIGURE 12-14)	REF

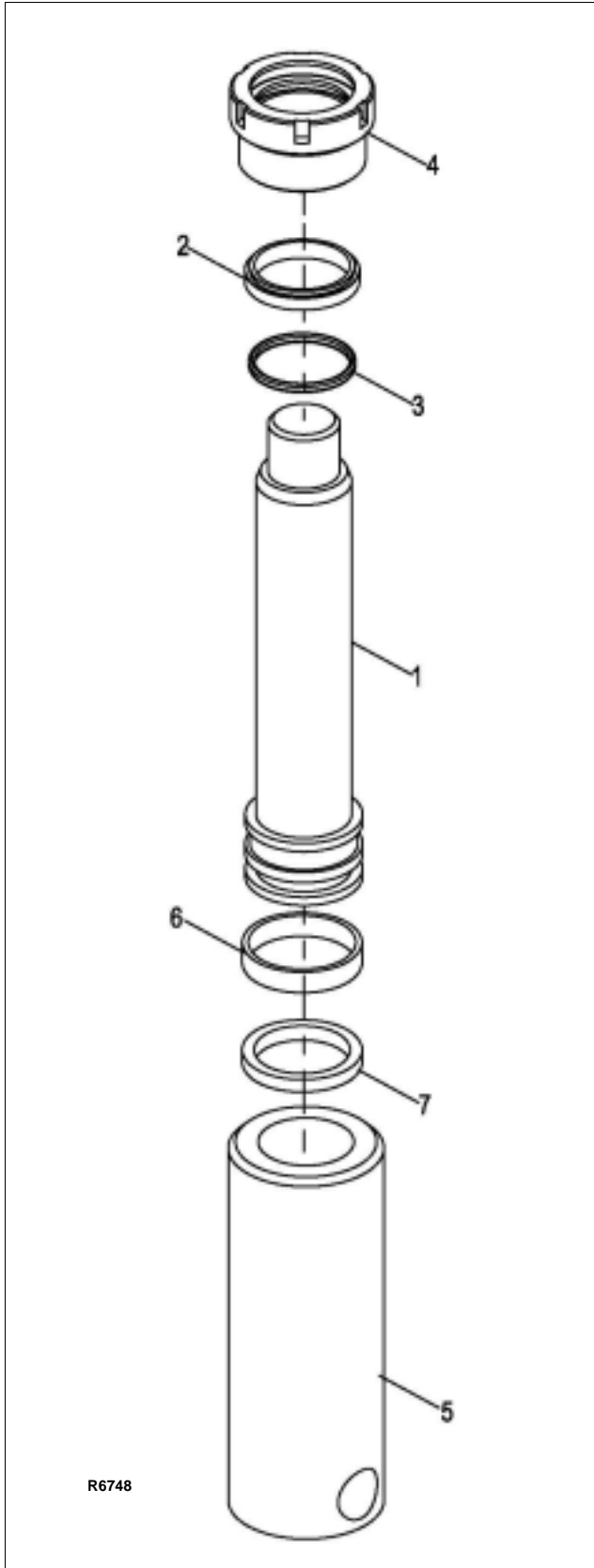


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Figure 12-14 Pump & Motor Assy

INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	1115-510001-00	PUMP & MOTOR ASSY	1
1	1115-560001-00	• CLAMP	1
2	1115-560002-00	• SOLENOID	1
3	1115-560003-00	• MOTOR	1
4	1115-560004-00	• VALVE	1
5	1115-560005-00	• THROTTLE VALVE	1
6	1115-560006-00	• SAFETY VALVE	1
7	1115-560007-00	• BALL	2
8	1115-560008-00	• SCREW, M3 X 8	1
9	1115-560009-00	• FUEL RETURN PIPE	1
10	1115-560010-00	• CONNECTING SHAFT	1
11	1115-560011-00	• GEAR PUMP	1
12	1115-560012-00	• WASHER, M5	2

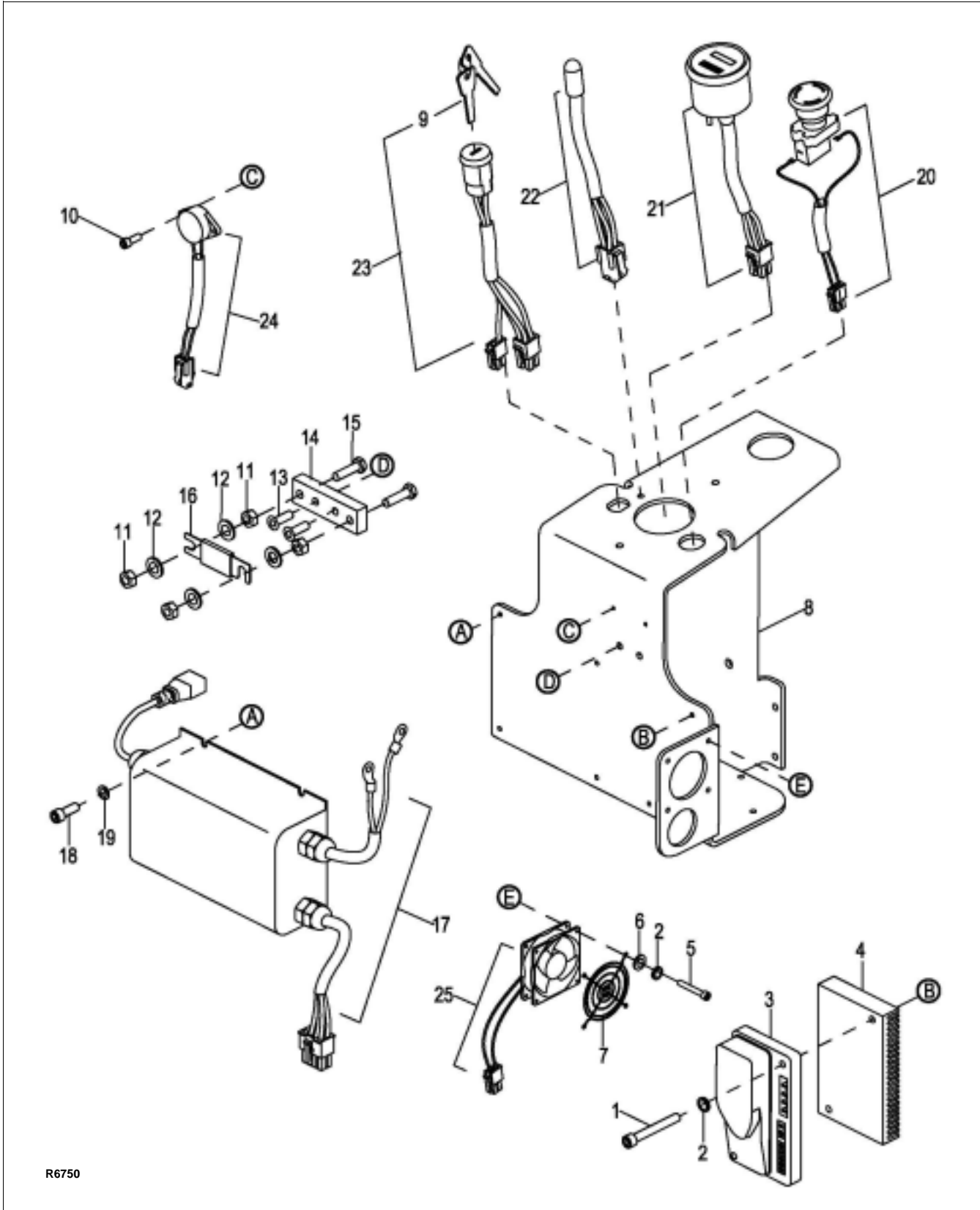
INDEX NO.	PART NO.	PART NAME	NO. REQD.
13	1115-560013-00	• SCREW, M5 X 70	2
14	1115-560014-00	• SUCTION PIPE	1
15	1115-560015-00	• OIL FILTER	1
16	1115-560016-00	• CHECK VALVE	1
17	1115-560017-00	• SOLENOID VALVE	1
18	1115-560018-00	• CLAMP	1
19	1115-560019-00	• O-RING	1
20	1115-560020-00	• RESERVOIR	1
21	1115-560021-00	• SCREW, 3/8	1
22	1115-560022-00	• WASHER, 3/8	1
23	1115-560023-00	• O-RING	3
24	1115-560024-00	• AIR CLEANER	1



INDEX NO.	PART NO.	PART NAME	NO. REQD.
—	1115-410000-0A	LIFT CYLINDER	1
1	1115-410001-0A	• PISTON ROD	1
2	0000-000672-00	• WIPER RING	1
3	0000-000673-00	• O-RING	1
4	1115-410002-0A	• GLAND NUT	1
5	1115-411000-0A	• CYLINDER BODY	1
6	1115-410003-00	• GUIDE RING	1
7	0000-000512-00	• SEAL RING	1
—	1115QSYG	SEAL KIT (INCLUDES ITEMS 2, 3, 7)	1

Figure 12-15 Lift Cylinder

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Figure 12-16 Electrical System

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	0000-000664-00	SCREW, M4 X 40	2
2	0000-000122-00	WASHER, LOCK, M4	6
3	1115-510004-00	CONTROLLER	1
4	1115-510005-00	HEAT SINK	1
5	0000-000665-00	SCREW, M4 X 45	4
6	0000-000005-00	WASHER, FLAT, M4	4
7	1115-500007-00	GUARD	1
8	1115-511000-0A	BRACKET	1
9	1115-500008-00	KEY	2
10	0000-000666-00	SCREW, M3 X 8	2
11	0000-000196-00	NUT, M8	4
12	0000-000194-00	WASHER, FLAT, M8	4
13	0000-000126-00	SCREW, M6 X 16	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
14	1120-540001-00	STAND, FUSE	1
15	0000-000297-00	BOLT, M8 X 35	2
16	1115-510003-00	FUSE	1
17	1115-520014-00	CHARGER ASSEMBLY	1
18	0000-000088-00	SCREW, M4 X 8	4
19	0000-000194-00	WASHER, FLAT, M8	4
20	1115-520011-00	SWITCH, EMERGENCY STOP	1
21	1115-520005-00	BATTERY INDICATOR	1
22	1115-520013-00	LED INDICATOR	1
23	1115-520003-00	KEY SWITCH ASSEMBLY	1
24	1115-520015-00	BUZZER ASSEMBLY	1
25	1115-520007-00	FAN ASSEMBLY	1

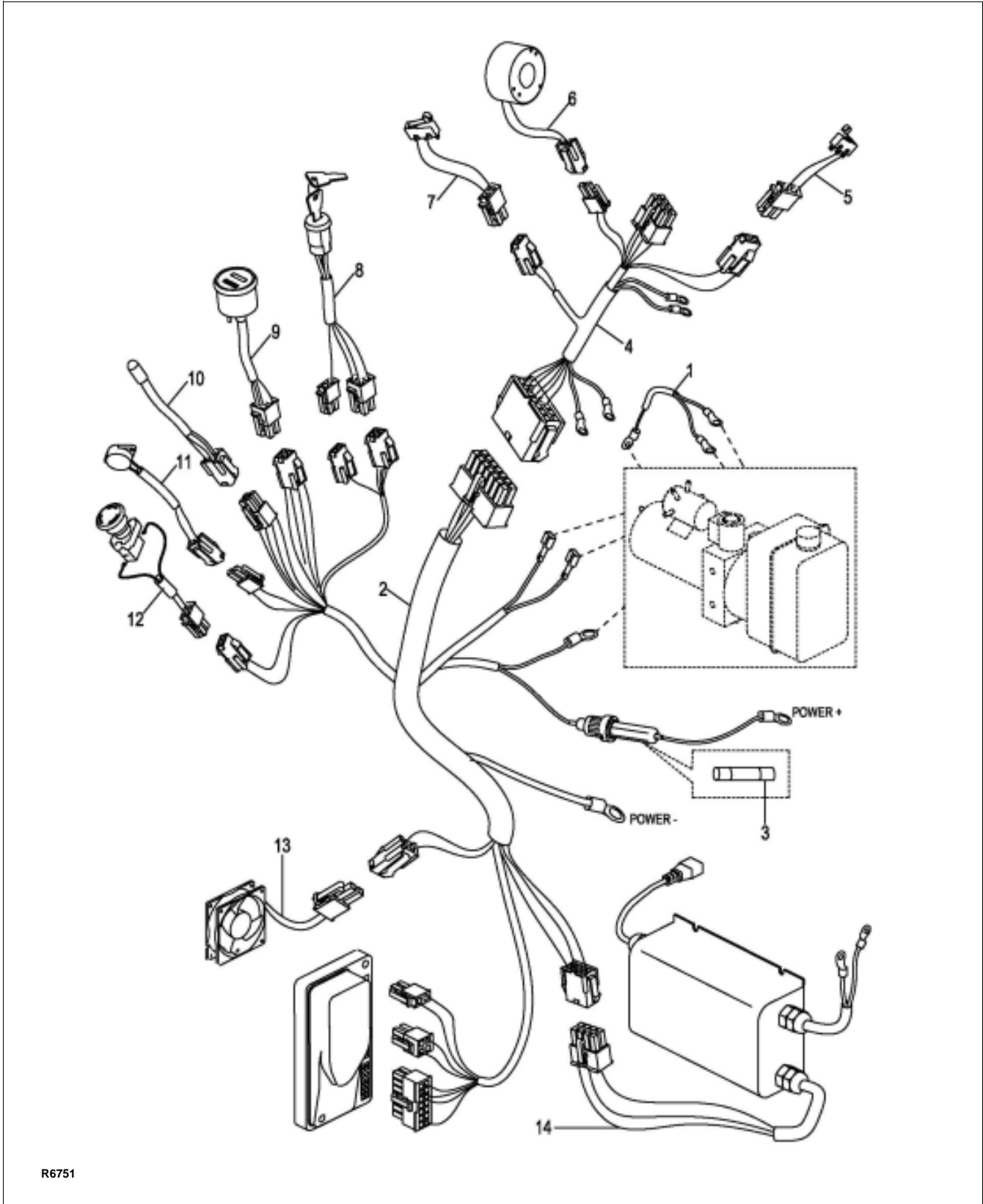
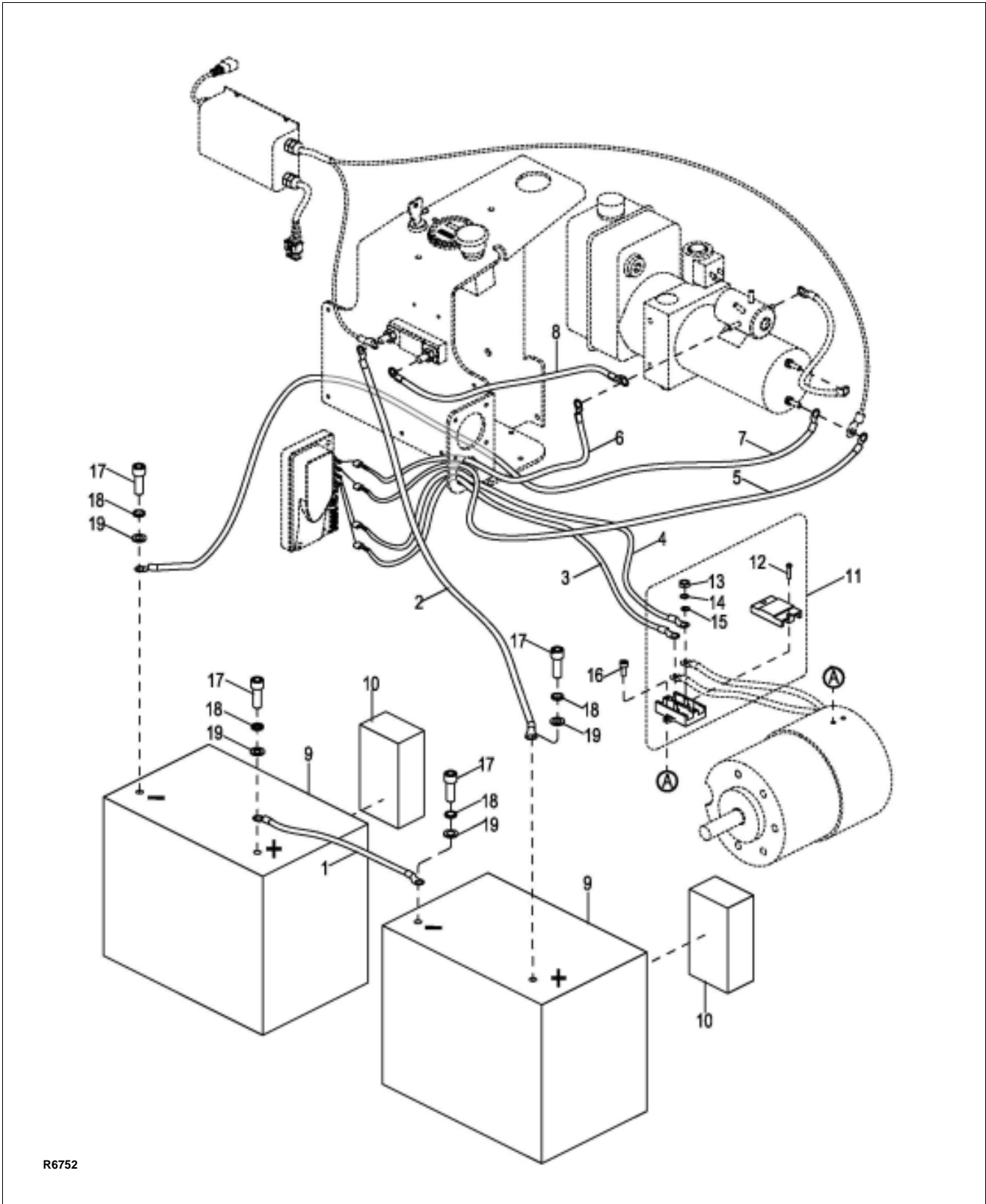


Figure 12-17 Wiring Harness

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	1115-520016-00	HARNESS, PUMP	1
2	1115-520001-00	HARNESS, MASTER	1
3	1120-500015-00	FUSE, 10A	1
4	1115-520002-00	HARNESS	1
5	—	SWITCH ASSY, DEADMAN (FIGURE 12-1)	REF
6	—	BRAKE ASSEMBLY (FIGURE 12-7)	REF
7	—	SWITCH ASSY, LIMIT (FIGURE 12-9)	REF
8	—	KEY SWITCH ASSEMBLY (FIGURE 12-16)	REF

INDEX NO.	PART NO.	PART NAME	NO. REQD.
9	—	BATTERY INDICATOR (FIGURE 12-16)	REF
10	—	LED INDICATOR (FIGURE 12-16)	REF
11	—	BUZZER ASSEMBLY (FIGURE 12-16)	REF
12	—	SWITCH, EMERGENCY STOP (FIGURE 12-16)	REF
13	—	FAN ASSEMBLY (FIGURE 12-16)	REF
14	—	CHARGER ASSEMBLY (FIGURE 12-16)	REF



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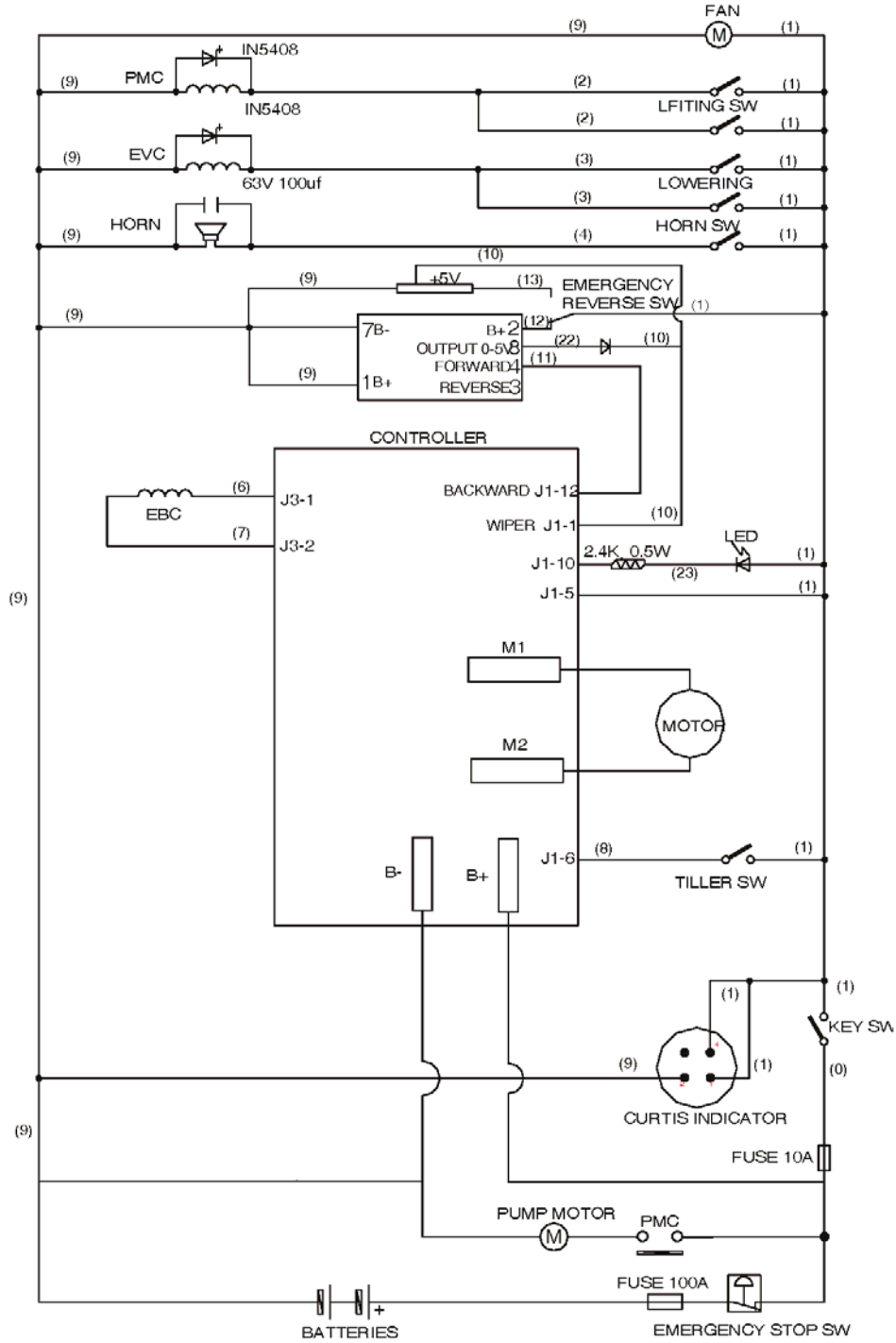
Figure 12-18 Wiring Cables

INDEX NO.	PART NO.	PART NAME	NO. REQD.
1	1115-530008-00	CABLE, BATTERY CON- NECTOR	1
2	1115-530007-00	CABLE, BATTERY +	1
3	1115-530004-00	CABLE, M2	1
4	1115-530003-00	CABLE, M1	1
5	1115-530001-00	CABLE, B+	1
6	1115-530002-00	CABLE, B-	1
7	1115-530005-00	CABLE, P+	1
8	1115-530006-00	CABLE, P-	1
9	1115-500005-00	BATTERY	2
10	1115-100001-00	BLOCK, EPE	2

INDEX NO.	PART NO.	PART NAME	NO. REQD.
11	1115-231000-00	BRACKET	1
12	0000-000646-00	• SCREW, M4 X 10	2
13	0000-0001089-00	• NUT, M6	2
14	0000-000056-00	• WASHER, LOCK, M6	2
15	0000-000023-00	• WASHER, FLAT, M6	2
16	0000-000004-00	SCREW, M5 X 12	2
17	0000-000109-00	SCREW, M8 X 16	4
18	0000-000159-00	WASHER, LOCK, M8	4
19	0000-000176-00	WASHER, FLAT, M8	4



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